ROBUR

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Installation, use and maintenance manual

GAHP Line W and W LB Series

Absorption heat pump

for heating and cooling medium-large areas

Fired by natural gas fired/LPG and renewable energy

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PREFACE

This manual supplies information for the installation, operation and servicing of the Robur Water-Water Gas Absorption Heat Pump GAHP-W and the Robur Water-Water Gas Absorption Heat Pump GAHP-W LB.

It is strongly recommended that this manual be completely reviewed before proceeding with an installation.

This manual is specifically intended for:

- End users: for the operation of the appliance according to their own requirements;
- Contractors for a correct hydraulic and electric installation of the appliance.

Retain this manual for future reference.

	Danger
	Warning
	Note
	Start of operating procedure
	Reference to another part of the manual or other document

Table 1 Description icons

SECTION 1 WARNINGS

This manual is designed to be an installation and user's guide for the Robur GAHP-W, Gas Absorption Heat Pumps series.This product must be installed, started up and serviced by a qualified installer.
Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death.
Improper installation and/or operation will void the warranty.
As an additional measure of safety, Robur strongly recommends installation of suitable Carbon Monoxide (CO) detectors in the vicinity of this appliance and in any adjacent occupied spaces.

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

DO NOT Use this appliance if any part has been under water. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.

Consult and follow local Building and Fire Regulations and other Safety Codes that apply to this installation. Consult your local gas utility company to authorize and inspect all gas and flue connections.

Your conventionally vented gas appliance must have a supply of fresh air circulating around it during burner operation for proper gas combustion and proper venting.

Packing items (plastic bags, polystyrene foam, nails, etc.) must be kept out of the reach of children, as they are potentially dangerous.

The appliance must only be used for the purposes for which it has been designed. Any other use is considered inappropriate and therefore dangerous. The

manufacturer does not accept any contractual or extra-contractual liability for any damage caused by improper use of the appliance.

The appliance is not intended to be used by persons (including children) whose physical, sensory and mental capacities are impaired, or who lack the necessary experience and knowledge, unless they are supervised or instructed in its use by persons responsible for their safety. Children must be supervised to ensure that they do not play with the appliance.

The unit uses a water/ammonia absorption cycle for hot/cold water production. The ammonia is in a water solution inside a sealed circuit tested for leaks by the manufacturer. In case of refrigerant leaks, switch off the electrical power and gas supplies only if this can be done in total safety. Contact your Authorised Service Center.

The safety valve must be ducted to the outdoors. Refer to Chapter 2.9 on page 31. The unit MUST NOT BE OPERATED if the safety valve is not ducted.

Frequent water filling in the loop may result in unit damage due to scale and corrosion, depending on the quality of the water being used. Make sure the system is water tight and that the expansion tank is operational.

Concentrations of chlorides or free chlorine in the circuit above the values given in Table 17 on page 31 will damage the unit heat exchangers and void the warranty.

Shut off the gas supply before working on the gas circuit. Upon completing work on the gas circuit, check for leaks as required by regulations.

Do not operate the appliance if dangerous conditions exist: smell of gas in the pipeline or near the appliance; parts of the appliance submerged in water or otherwise damaged; controls or safety components bypassed or defective.
In these cases, ask for assistance to a qualified installer or Service Company.
Do not remove safety guards because there are components moving also during the start-up and shut-down cycles of the unit. Make sure the appliance cannot be started up inadvertently.

POISONING HAZARD
Make sure the flue gas components are tightly sealed and compliant with local and national regulations.
If the appliance is installed indoors, insufficient or non compliant ventilation (see installation instructions) can result in dangerous leak of flue gases. If the installation is not compliant, do not start up the appliance.
Inform the installer and the end user.

FIRE HAZARD

The appliance contains hot parts. Do not open the appliance or touch the flue outlet pipe. If necessary, contact a qualified service company.
The appliance has a sealed circuit classified as pressure equipment, i.e. with internal pressure higher than atmospheric pressure. The fluids contained in the sealed circuits are harmful if swallowed or inhaled, or if they come into contact with the skin. Do not carry out any operation on the sealed circuit or its valves.

ELECTRIC SHOCK HAZARD

- Use only approved components for the electrical connections, as specified by the manufacturer.
- Disconnect the electrical power supply before working on the appliance's internal electrical equipment (electrical panel, motors, control board, etc.).
- Make sure the appliance cannot be started up inadvertently.

The electrical safety of the appliance is ensured only when it is correctly connected to an efficient grounding system, compilant with local and national safety regulations

HARMFULL SUBSTANCES IN THE AIR

Hydrogenated hydrocarbons, which contain chlorine and fluorine compounds, will increase the corrosion of the unit.
Make sure the air supply is free of harmfull substances.

SUGGESTIONS FOR THE CLIENT

Stipulate a maintenance contract with an authorised contractor for the annual inspection of the appliance and maintenance when needed.
Maintenance and repairs may only be done by a contractor legally authorised to work on gas appliances and equipment.
Use only original spare parts.

SECTION 2 OVERVIEW AND TECHNICAL SPECIFICATIONS

This manual supplies information for the installation, operation and servicing of the Robur Water-Water Gas Absorption Heat Pump GAHP-W and the Robur Water-Water Gas Absorption Heat Pump GAHP-W LB.

Read this manual carefully before installation.

The Robur GAHP-W (Gas Absorption Heat Pump) is available in 2 versions:

- GAHP-W: this is a water-to-water gas fired absorption heat pump which has been designed to recover thermal energy from water sources (wells, rivers, lakes, process water, etc…). It can be used for heating, cooling and DHW production.
- GAHP-W LB: this is a also a water-to-water gas fired absorption heat pump which has been designed to recover thermal energy from the ground through geothermal piping (not supplied) either vertically or horizontally. It can be used for heating, cooling and DHW production.

The Robur GAHP-W is controlled by two electronic boards:

- S61 electronic board
- W10 board

The operating temperatures are measured by the following 6 probes:

- Cod water outlet
- Cold water inlet
- Hot water outlet
- Hot water inlet
- Refrigerant temperature condenser inlet
- Ambient temperature

Other safety and control devices:

- Manual reset high temperature limit (for sealed system).
- Automatic reset flue gas thermostat.
- Cold water flow switch.
- Hot water flow switch.
- Ignition control box.
- Flue gas pressure switch.
- Oil pump rotation sensor.
- High temperature limit (for hot water).
- Sealed system relief valve (to be ducted as indicated in chapter 2.9 on page 31).
- Water antifreeze function.
- Direct Digital Controller (DDC) available as an optional.

2.1 GAHP-W – TECHNICAL SPECIFICATIONS

		GAHP-W	GAHP-W LB
PERFORMANCE RATINGS			
EVAPORATOR INLET TEMPERATURE (COLD SIDE)	°F	50	32
CONDENSER OUTLET TEMPERATURE (HOT SIDE)	°F	122	122
HEATING CAPACITY (1)	kBtu/h	132.4	119.4
EFFICIENCY (HEATING)	%	139	125
CHILLING CAPACITY (1)	kBtu/h	54.6	46.1
EFFICIENCY (CHILLING)	%	57	48
HOT WATER FLOW RATE	GPM	14.5	13.2
ΔT HOT SIDE	°F	18	18
HOT SIDE PRESSURE DROP (CONDENSER)	Ft (WC) PSIg	12.7 5.51	10.5 4.50
CHILLED WATER FLOW RATE	GPM	12.3	11.0
ΔT COLD SIDE	°F	9	9
COLD SIDE PRESSURE DROP (EVAPORATOR)	kPa PSIg	12.7 5.51	15.4 6.67
OPERATIONAL LIMITS			
COLD SIDE WATER FLOW RATE (EVAPORATOR) – MIN/MAX	GPM	10.1/20.7	8.8/17.6
EVAPORATOR MAXIMUM INLET TEMPERATURE	°F	113.0	113.0
EVAPORATOR MINIMUM OUTLET TEMPERATURE	°F	37.4	23.0
HOT SIDE WATER FLOW RATE (CONDENSER) – MIN/MAX	GPM	6.2/22.0	
HOT WATER MINIMUM RETURN TEMPERATURE IN CONTINUOUS OPERATION (6)	°F	68	
CONDENSER MAXIMUM INLET TEMPERATURE	°F	+113.0	
CONDENSER MINIMUM INLET TEMPERATURE	°F	+35.6	
CONDENSER MAXIMUM OUTLET TEMPERATURE	°F	149	140
AMBIENT TEMPERATURE - MIN/MAX	°F	10.4/113.0	
BURNER SPECIFICATIONS			
NOMINAL HEAT CAPACITY (14.4 PSI – 68 °F)	kBtu/hr	95.5	
ELECTRICAL RATINGS			
REQUIRED VOLTAGE, 60HZ, SINGLE PHASE (2)	V	208-230	
MINIMUM CIRCUIT AMPACITY (MCA) Unit only	A	15	
MAXIMUM OVER CURRENT PROTECTION (MOCP)	A	15	
TOTAL ELECTRICAL OPERATING CONSUMPTION (NOMINAL) (3)	kW	0.4	
PHYSICAL DATA			
OPERATING WEIGHT	Pounds	630.5	
WATER VOLUME PER WATER CIRCUIT (4)	Gallons	0.79	
DIMENSIONS WIDTH DEPTH HEIGHT	Inches	33-1/4 25-3/4 50-3/4	
INLET/OUTLET WATER PIPE DIAMETERS	FPT	1” 1/4	
GAS PIPE DIAMETER	FPT	1/2	
DIAMETER EXHAUST FLUE PIPE (5)	Inches	3-1/8	

Table 2 - GAHP-W performance ratings and operational limits.

(1) ALL ILLUSTRATIONS AND SPECIFICATIONS CONTAINED HEREIN ARE BASED ON THE LATEST INFORMATION AVAILABLE AT THE TIME OF PUBLICATION APPROVAL. ROBUR RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE, IN MATERIALS, SPECIFICATIONS, AND MODELS OR TO DISCONTINUE MODELS.

(2) UNITS ARE FACTORY-WIRED FOR 230 VOLT OPERATION.

(3) MAY VARY BY ±10% AS A FUNCTION OF BOTH POWER SUPPLY AND ELECTRICAL MOTOR INPUT TOLERANCE.

(4) THE UNIT HAS 2 WATER CIRCUITS. THE VALUE IS REFERRED TO A SOLUTION OF QUALITY TAP WATER AND 10% BY VOLUME OF INHIBITED PERMANENT ANTIFREEZE. HIGHER ANTIFREEZE CONCENTRATIONS MAY BE REQUIRED IN CERTAIN APPLICATIONS. MONO-ETHYLENE GLYCOL MAY CAUSE CORROSION IN GALVANIZED METAL PIPES.

(5) FOR EXHAUST DUCT DIMENSIONS SEE , PAGE 62.

(6) IN TRANSIENT OPERATION, LOWER TEMPERATURES ARE ALLOWED.

GAHP-W – HEATING AND CHILLING CAPACITIES

GAHP-W HEATING CAPACITY - kBtu/hr						
	HOT WATER INLET TEMPERATURE					
CHILLED WATER INLET TEMPERATURE	77.0	86.0	95.0	104.0	113.0	113.0
	DT=18					DT=36
46.4	142.4	140.0	136.0	129.0	121.5	117.7
50.0	142.6	140.9	138.2	132.4	125.3	121.3
53.6	142.6	141.4	139.6	134.9	128.8	124.8
59.0	142.6	141.6	140.5	137.6	133.3	129.4
68.0	142.6	141.6	140.7	139.5	137.7	134.7
77.0	142.6	141.6	140.7	139.7	138.8	137.0
86.0	142.6	141.6	140.7	139.7	138.8	137.2

Table 3 - GAHP-W heating capacity. DT is the difference between outlet and inlet temperature.

GAHP-W CHILLING CAPACITY - kBtu/hr						
	HOT WATER INLET TEMPERATURE					
CHILLED WATER INLET TEMPERATURE	77.0	86.0	95.0	104.0	113.0	113.0
	DT=18					DT=36
46.4	63.7	61.2	56.7	51.7	46.0	42.5
50.0	64.1	62.2	58.9	54.8	49.9	46.0
53.6	64.2	62.9	60.6	57.4	53.3	49.0
59.0	64.3	63.6	62.4	60.4	57.1	52.9
68.0	64.3	64.0	63.5	62.4	60.6	57.9
77.0	64.3	64.0	63.5	62.4	61.6	60.1
86.0	64.3	64.0	63.5	62.4	61.7	60.0

Table 4 - GAHP-W chilling capacity. DT is the difference between outlet and inlet temperature.

GAHP-W LB – HEATING AND CHILLING CAPACITIES

GAHP-W LB HEATING CAPACITY - kBtu/hr						
	HOT WATER INLET TEMPERATURE					
CHILLED WATER INLET TEMPERATURE	77.0	86.0	95.0	104.0	113.0	113.0
	DT=18					DT=27
32	132.7	129.7	125.2	119.4	112.0	112.0
41	133.7	131.7	129.0	124.6	117.5	117.5
50	133.8	133.1	131.3	128.4	122.8	122.8
59	133.8	133.7	132.6	131.0	127.4	127.4
68	133.8	133.8	133.2	132.4	130.7	130.7
77	133.8	133.8	133.5	132.9	132.5	132.5

Table 5 - GAHP-W LB heating capacity. DT is the difference between outlet and inlet temperature.

GAHP-W LB CHILLING CAPACITY - kBtu/hr						
	HOT WATER INLET TEMPERATURE					
CHILLED WATER INLET TEMPERATURE	77.0	86.0	95.0	104.0	113.0	113.0
	DT=18					DT=27
32	55.9	53.9	50.5	46.1	37.6	37.6
41	57.4	56.0	53.5	49.8	43.1	43.1
50	58.2	57.3	55.8	53.3	48.0	48.0
59	58.4	58.0	57.1	55.6	52.0	52.0
68	58.4	58.1	57.5	56.6	54.8	54.8
77	58.4	58.1	57.5	56.7	56.0	56.0

Table 6 - GAHP-W LB chilling capacity. DT is the difference between outlet and inlet temperature.

GAHP-W and GAHP-W LB PRESSURE DROP

GAHP-W, GAHP-W LB - Heating mode ΔP			
Hot water flow	**Outlet water temperature**		
	86.0 °F	**104.0 °F**	**122.0 °F**
GPM	ΔP ft of Head	ΔP ft of Head	ΔP ft of Head
6.60	3.29	3.14	2.91
7.71	4.17	3.98	3.71
8.81	5.28	5.02	4.70
9.91	6.60	6.25	5.89
11.01	8.12	7.67	7.25
12.11	9.83	9.25	8.79
13.21	11.72	11.00	10.47
14.31	13.77	12.90	12.31
15.41	15.97	14.94	14.27
16.51	18.30	17.11	16.36
17.61	20.76	19.41	18.56
18.71	23.32	21.81	20.86
19.81	25.98	24.32	23.25
20.91	28.73	26.92	25.71
22.01	31.55	29.60	28.24

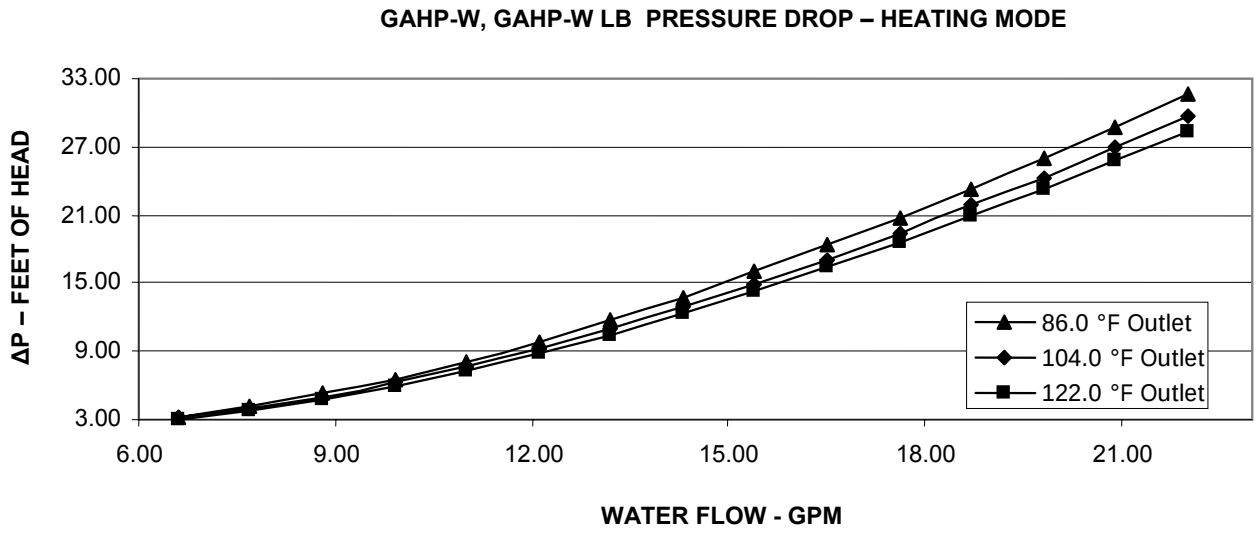
Table 7 - GAHP-W, GAHP-W LB pressure drop – heating mode.

GAHP-W - Chilling mode ΔP			
Hot water flow	Outlet water temperature		
	37.4 °F	46.4 °F	55.4 °F
GPM	ΔP ft of Head	ΔP ft of Head	ΔP ft of Head
6.60	4.26	3.98	3.88
7.71	5.34	5.12	4.93
8.81	6.70	6.50	6.22
9.91	8.35	8.11	7.73
11.01	10.25	9.94	9.47
12.11	12.40	11.99	11.42
13.21	14.78	14.23	13.56
14.31	17.37	16.66	15.89
15.41	20.15	19.27	18.39
16.51	23.11	22.06	21.06
17.61	26.23	25.01	23.88
18.71	29.49	28.11	26.85
19.81	32.88	31.35	29.94
20.91	36.38	34.72	33.16
22.01	39.97	38.22	36.48

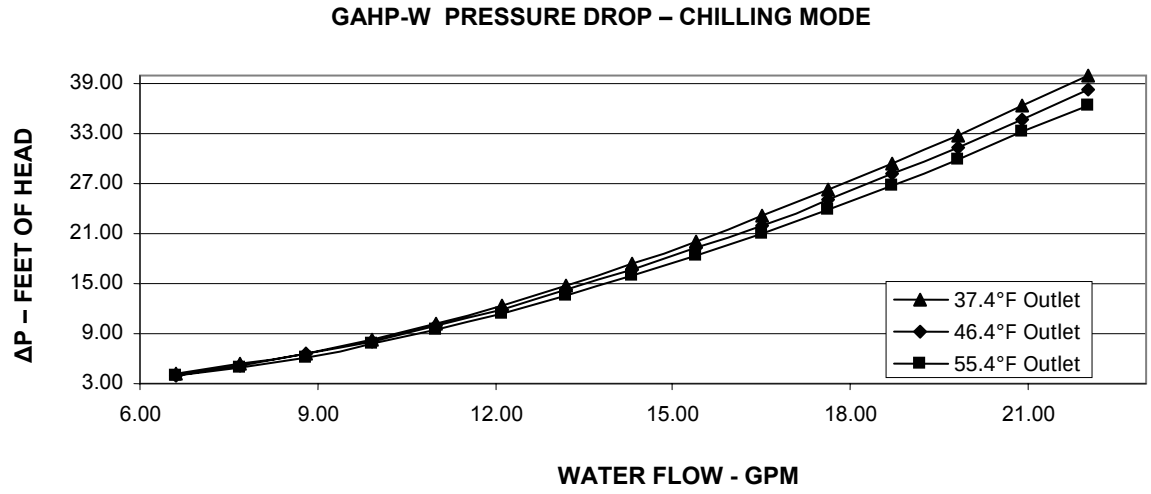
Table 8 - GAHP-W pressure drop – chilling mode.

GAHP-W LB - Chilling mode ΔP			
Hot water flow	Outlet water temperature		
	23.0 °F	32 °F	41.0 °F
GPM	ΔP ft of Head	ΔP ft of Head	ΔP ft of Head
6.60	6.36	5.36	4.66
7.71	8.37	7.03	6.12
8.81	10.72	9.04	7.87
9.91	12.73	11.05	9.61
11.01	15.40	13.40	11.65
12.11	17.75	15.74	13.69
13.21	20.43	18.42	16.02
14.31	23.11	20.76	18.06
15.41	26.12	23.44	20.39
16.51	29.13	26.12	22.73
17.61	32.15	28.80	25.06

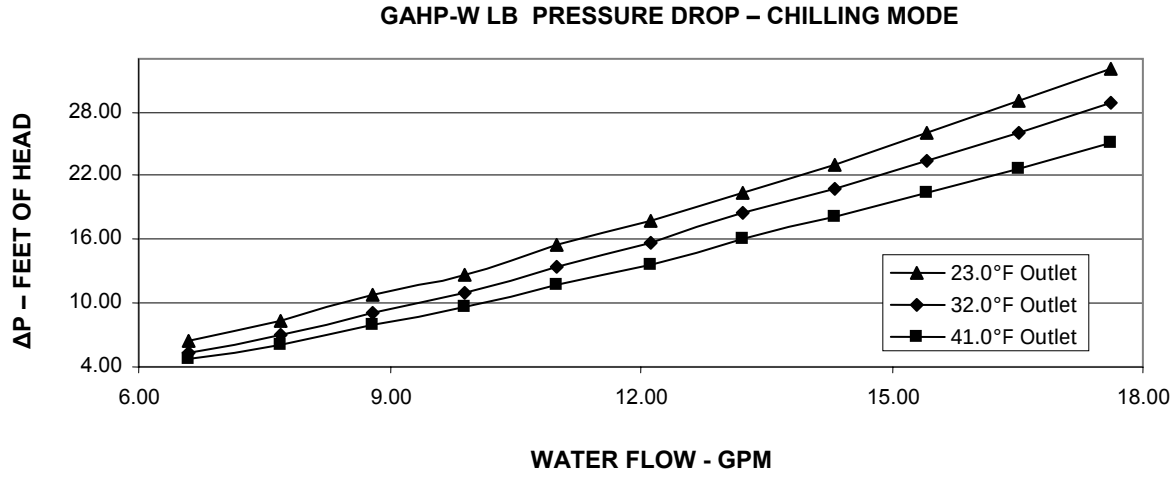
Table 9 - GAHP-W LB pressure drop – chilling mode.



Graph 1 - GAHP-W, GAHP-W LB pressure drop – heating mode (see on page 62).



Graph 2 - GAHP-W pressure drop – chilling mode (see on page 62).



Graph 3 - GAHP-W LB pressure drop – chilling mode (see on page 62).

2.2 CODES

The equipment shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These regulations shall be carefully followed in all cases. The local building authority must be consulted before installations are made. In the absence of such requirements, the installation shall conform:

- In the United States to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA54 and/or applicable local codes.
- In Canada to the latest edition of the Natural Gas and Propane Installation Code, CSA B149.1, CSA B149.2 and/or applicable local codes.

All electrical wiring is to be done in accordance with:

- In the U.S., the "National Electrical Code" (NEC), ANSI/NFPA 70, latest Edition and all applicable local codes as required.
- In Canada, the “Canadian Electrical Code – Part 1”, CSA STD. C22.1 and all applicable local codes as required.

This appliance must be electrically grounded in accordance with the applicable codes and standards referenced above.

2.3 LOCATION OF THE APPLIANCE

Make sure the GAHP heat pump does not have any transport damage. Check:

- the packaging
- the unit panels

Immediately upon delivery advise the carrier of any shortages or damage.

Packing items (plastic bags, polystyrene foam, nails, etc.) must be kept out of the reach of children, as they are potentially dangerous.

Before installing the appliance, carefully read the “Warning” information on page 3.

The unit is designed for indoor use only.
The unit must not be installed outdoors. The unit must not be exposed to rain.
The unit must be installed in a ventilated location and in compliance with local and national regulations.
A shut-off valve must be placed on the gas supply circuit.
Antivibration connections must be placed on the water connections to prevent vibration transmission.

The appliance should be located to provide required clearances on all sides for maintenance and inspection.

It should not be located in an area where leakage of any connections will result in damage to the area adjacent to the appliance or to lower floors of the structure.

When such a location is not available, it is recommended that a suitable drain pan, be installed under the appliance.

The appliance is design certified by CSAInternational for installation on combustible flooring; in basements; in closets, utility rooms or alcoves**.**

GAHP-W and GAHP-W LB units must never be installed on carpeting, tile or other combustible material other than wood flooring.

DO NOT install this appliance in any location where gasoline or flammable vapors are likely to be present.

The location for the appliance should be chosen with regard to the vent pipe lengths and external plumbing.

The unit shall be installed such that the gas ignition system components are protected from water during operation and service.

When vented vertically, the GAHP-W and GAHP-W LB units must be located as close as practical to a chimney or outside wall. If the vent terminal and/or combustion air terminal terminate through a wall, and there is potential for snow accumulation in the local area, both terminals should be installed at an appropriate level above grade such that blockage of the terminal from accumulated debris or precipitation is prevented.

This product must be installed and serviced by a qualified installer.

2.4 GAHP-W AND GAHP-W LB DIMENSIONS

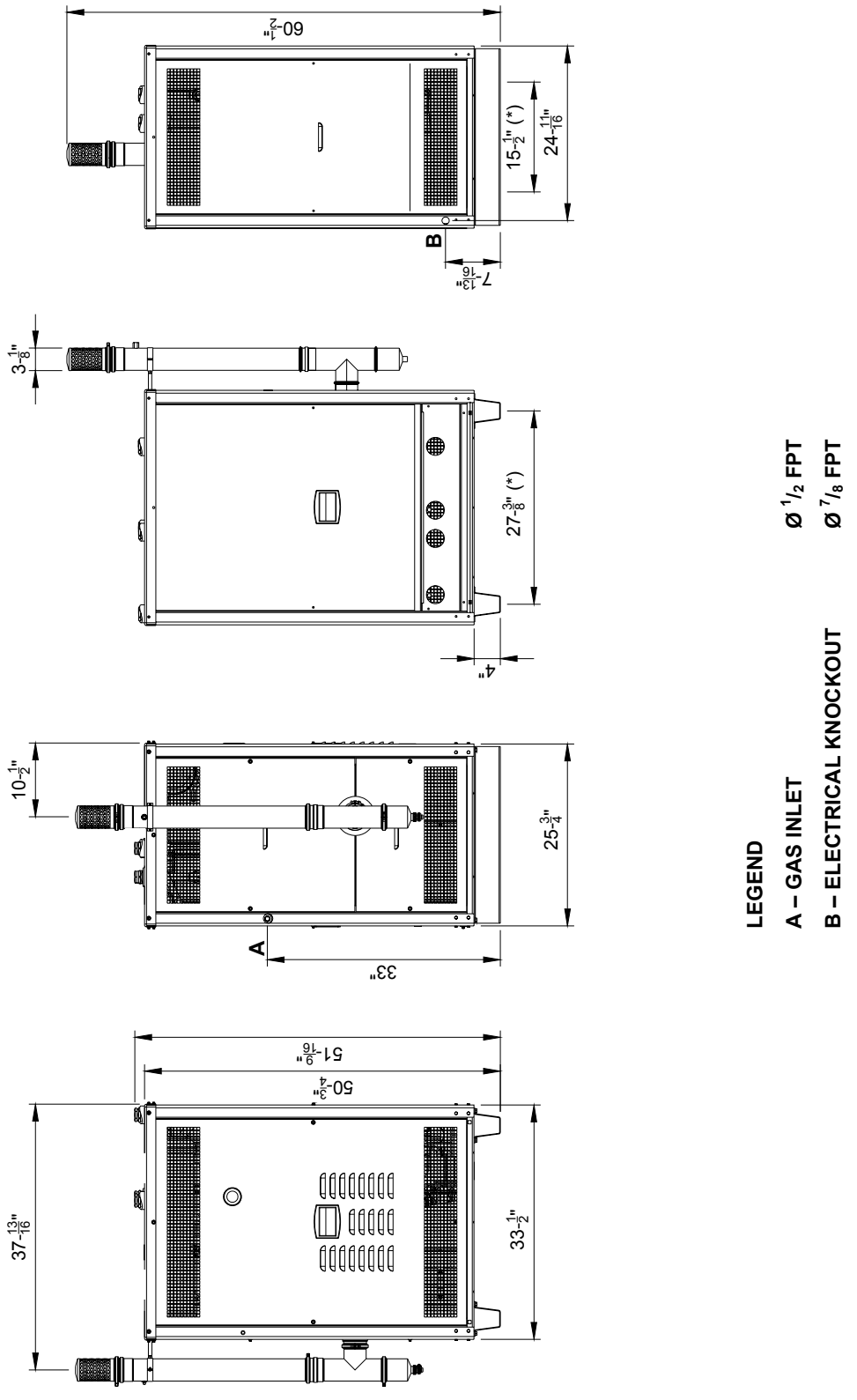


Figure 1 – GAHP-W and GAHP-W LB external dimensions.

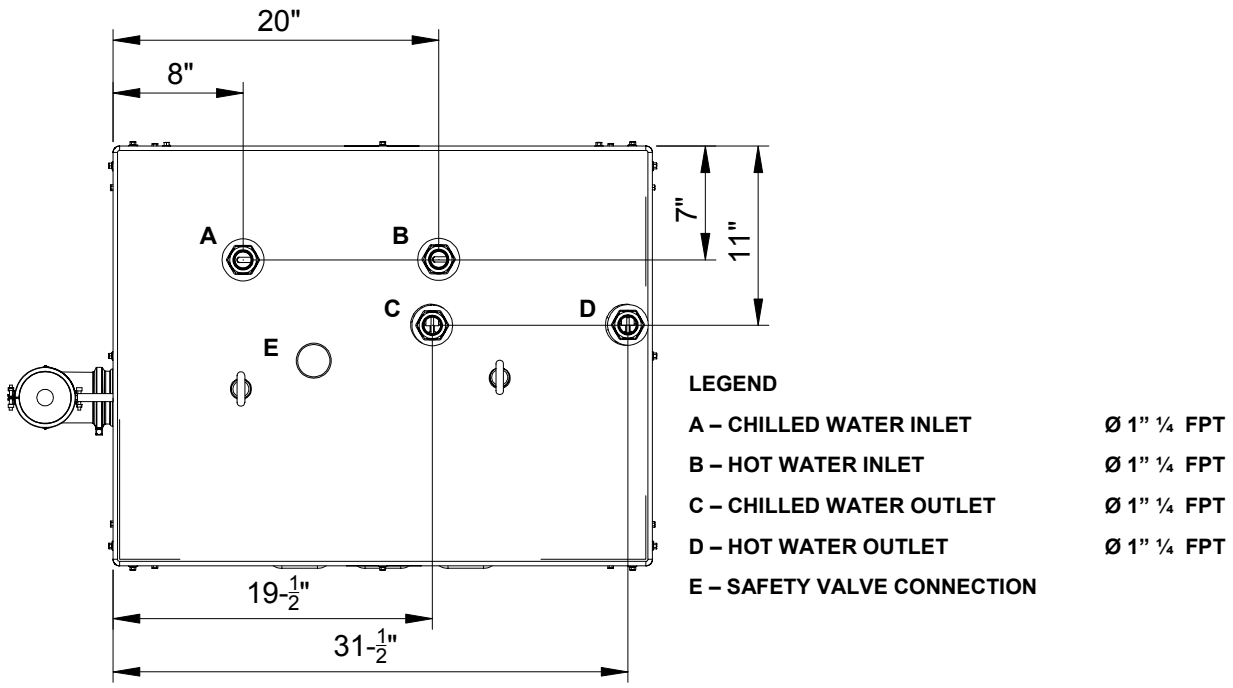


Figure 2 – GAHP-W and GAHP-W LB connection dimensions.

2.5 PLACING OF THE APPLIANCE

Do not remove packaging during handling on the installation site.

Packing must only be removed upon final installation.

If the appliance has to be lifted, pass slings into the openings in the base supports and use spreader bars to prevent the slings from damaging the casing during handling.

The lifting crane and all accessory devices (braces, cables, bars) must be suitable sized for the load to be lifted.

See Table 2, on page 8 for the weight and dimension of the appliance.

The manufacturer cannot be held responsible for any damage occurred during the placing of the appliance.

Place the appliance on a flat and leveled fireproof surface.

The appliance must be installed level.

REQUIRED CLEARANCES FROM COMBUSTIBLE MATERIALS AND FOR SERVICE ACCESS.

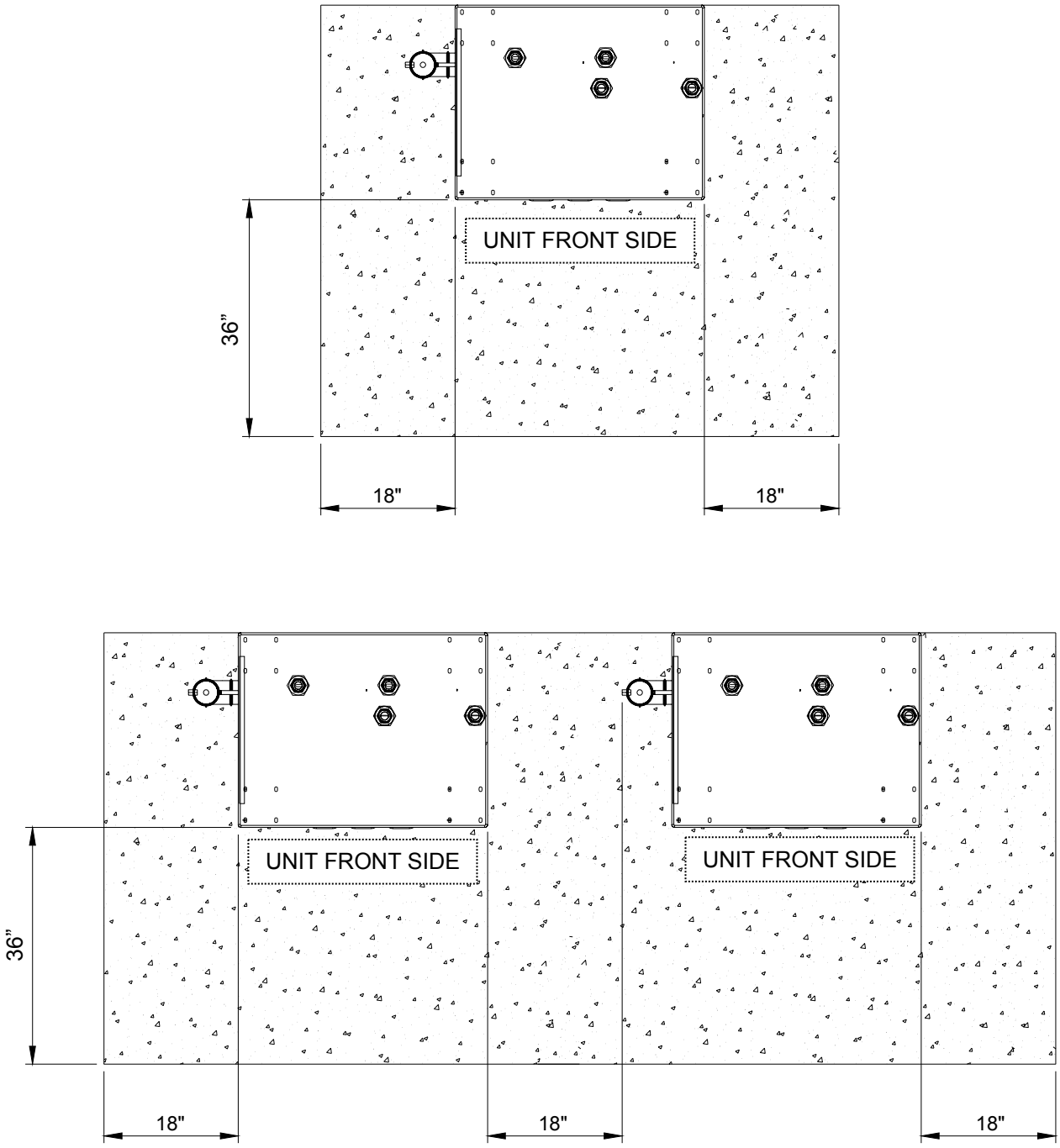


Figure 3 - Minimum clearances; single unit installation and multiple unit installation.

2.6 VENTING AND COMBUSTION AIR

As an additional measure of safety, Robur strongly recommends installation of suitable Carbon Monoxide (CO) detectors in the vicinity of this appliance and in any adjacent occupied spaces.

Combustion Air

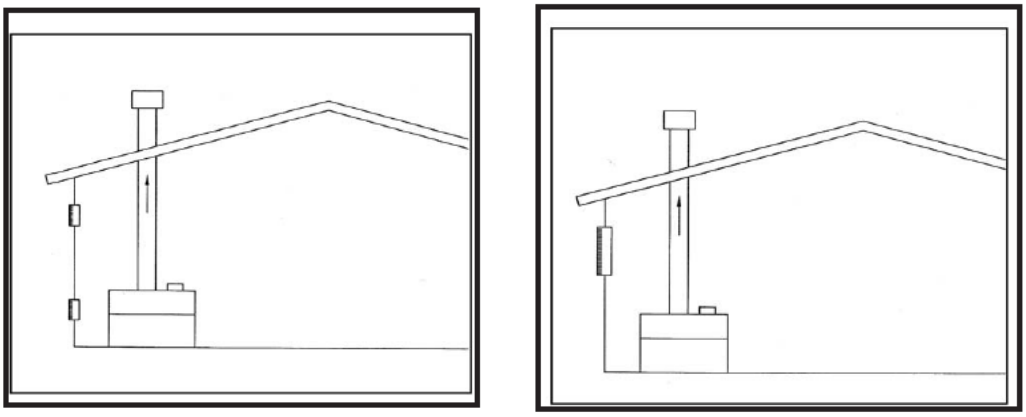
GAHP-W and GAHP-W LB units must have provisions for combustion and ventilation air in accordance with the applicable sections addressing requirements for air for combustion and ventilation of the National Fuel Gas Code, ANSI Z223.1.

In Canada, the applicable sections of the Natural Gas and Propane Installation Code (CSA B149.1) must be followed. In all cases any and all applicable local installation codes must also be followed.

GAHP-W and GAHP-W LB UNITS MUST receive combustion air from the space in which it is installed.

The room where the appliance is installed MUST be provided with properly sized openings to assure adequate combustion air and proper ventilation.

- Air provided directly from out side the building with no duct:
    - Two air openings:
      Combustion air opening, with a minimum free area of one square inch per 4,000 Btu/hr input. This opening must be located within 12" of the top of the enclosure.
      Ventilation air opening, with a minimum free area of one square inch per 4,000 Btu/hr input. This opening must be located within 12" of the bottom of the enclosure.
    - One air opening:
      The opening must be sized based on a minimum free area of one square inch per 3,000 Btu/hr. This opening must be located within 12" of the top of the enclosure.



Two air openings | One air openings

Figure 4

- Air taken from the outdoors using a duct to deliver the air to the mechanical room:

- Each of the two openings should be sized based on a minimum free area of one square inch per 2000 Btu/hr.

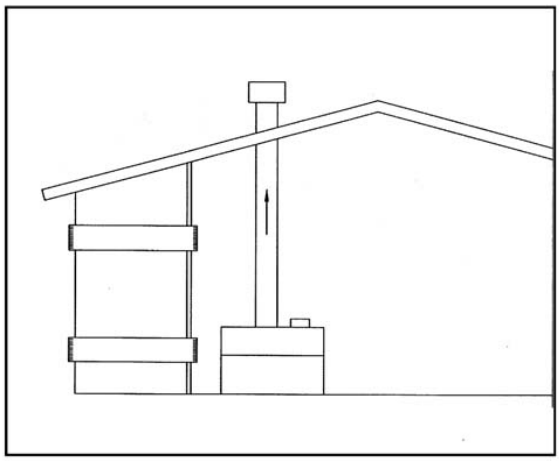


Figure 5

- Air taken from another interior space, each of the two openings specified below should have a net free area of one square inch for each 1,000 Btu/hr of input, but not less than 100 square inches.

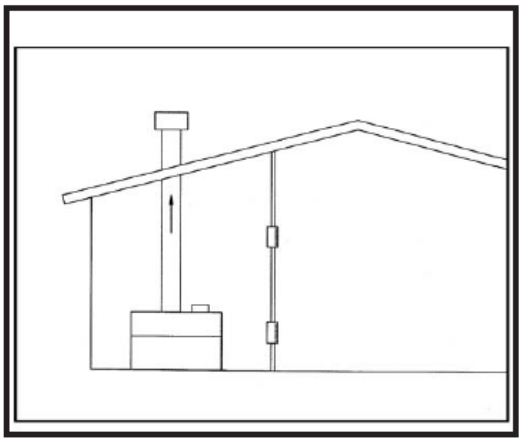


Figure 6

GAHP-W Input	Outside air 2 openings	Outside air 1 openings	Inside air 2 openings	Outside air through 2 ducts
95,500 Btu/h	24 in^2	32 in^2	96 in^2	48 in^2

Table 10

Outside air openings shall directly open to the outdoors. The above requirements are for the appliance only, additional gas fired appliances in the mechanical room will require an increase in the net free area to supply adequate combustion air for all appliances. Combustion air requirements are based on the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada refer to CSA International CAN/CGA B149.1 or B1 49.2 Installation Code.Check all local code requirements for combustion air.

All dimensions based on net free area in square inches. Metal louvers or screens may reduce the free area of a combustion air opening a minimum of approximately 25%. Check with louver manufacturers for exact net free area of louvers.

Under no circumstances should the equipment room ever be under a negative pressure. Particular care should be taken where exhaust fans, attic fans, clothes dryers, compressors, air handling units, etc. may take away air from the unit.

The combustion air supply must be completely free of any chemical fumes which may be corrosive to the appliance. Common chemical fumes which must be avoided are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichlorethylene, perchlorethylene, chlorine, etc. The result is improper combustion and a non-warrantable, premature appliance failure.

Any fan or equipment which exhausts air from the mechanical room may deplete the combustion air supply and/or cause a down draft in the venting system. Leakage of flue products from the venting system into an occupied living space can cause a very hazardous condition that must be immediately corrected. If a fan is used to supply combustion air to the boiler room, the installer must make sure that it does not cause drafts which could lead to nuisance operational problems with the appliance.

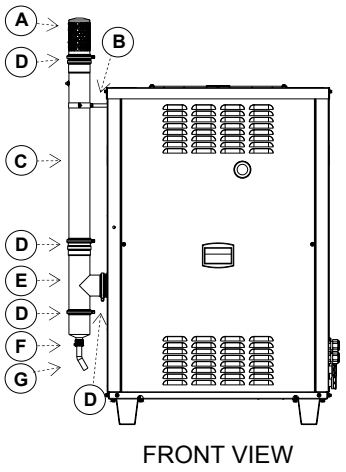
VENTING

For connection to gas vents or chimneys, vent installations shall be in accordance with Part 12, Venting of Appliances, of the National Fuel Gas Code, ANSIZ223.1, appropriate sections of the Natural Gas Installation Code, CAN/CGA-B149.1, or the Propane Installation Code, CAN/CGA-B149.2, or applicable provisions of the local building codes.

The appliance shall not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

Robur heat pumps GAHP-W and W LB are classified as a Category III appliances per CSA equipment approvals and must be installed in accordance to International and local codes that apply to Category III appliances.

Each GAHP unit is delivered with a CSA certified kit which is a portion of the vent system. Inside the kit there are the following components:



FRONT VIEW

KEY

A TERMINAL
B CLAMP
C FLUE GAS PIPE
D HOSE CLAMP
E "T" CONNECTOR
F CONDENSATE TRAP
G HOSE CONNECTOR + CONDENSATE DRAIN TUBE

Figure 7 - Components of exhaust air duct kit

Please note that a transition fitting is required to connect the flue pipe supplied with the Robur unit to the additional flue pipe required to vent to the outdoors.

The exhaust temperature on the Robur models GAHP-W and GAHPW-LB will not exceed 475°F.

The maximum allowable pressure drop from the top of the chimney (Bottom of terminal fitting (A) shown in Figure 7) is 0.25 PSF (Pound Square Foot).

For example, if you use a 4” pipe diametern according to Table 11 on page 20 you can install:

- 10 feet of 4” pipe (0.04) + 2 elbows (0.05) + 10 feet of 4” pipe (0.04) = 0.13 PSF
  Which is less than 0.250 PSF. **OK (Correct installation).**
- 25 feet of 4” pipe (0.1) + 2 elbows (0.05) + 35 feet of 4” pipe (0.14) = 0.290
  Which is greater than 0.250 PSF. **NOT allowed!**

If necessary, a 5” pipe diameter may be used to remain below the maximum allowable pressure drop of 0.25 PSF (The maximum flue gas pipe length doubles). The PSF value for the 5” flue pipe is 0.002 PSF/F, for the elbow is 0.013 PSF, for the “T” is 0.015 PSF.

IMPORTANT NOTES:

- Pressure drops will vary by pipe manufacturer/supplier. Check the manufacturer’s technical data for the pipe you are using.
- The **vent gas temperature avoids excessive condensate production in the vent.** Condensate may form in the flue pipe. Therefore, a corrosion-resistant flue must be used and condensate collected by the flue gas pipe system must be routed to an appropriate drain or drainage system.

All local codes must be followed and will take precedent over factory recommendations.

PRESSURE DROP Ø 4” COMPONENTS			**ALLOWABLE PRESSURE DROP**
PIPE PSF/F	ANGLE PSF	“T” PSF	**PSF**
0.0040	0.025	0.031	**0.25**

Table 11 - VENTING PRESSURE DROPS

When the Robur GAHP-W and W LB units are vented with a horizontal discharge, it must be installed per this installation manual and the venting system manufacturer’s installation instructions. The vent system must be sealed stainless steel, per Table 12.

TERM	DESCRIPTION
PIPE	Must comply with Ul Standard 1738 such as Type AL29-4C Stainless Steel (either insulated or non insulated)
JOINT SEALING	Follow vent manufacturer’s instructions

Table 12

Route the vent pipe to the heater as directly as possible. Seal all joints and provide adequate hangers. Horizontal portions of the venting system must be supported to prevent sagging and may not have any low sections that could trap condensate.

The unit must not support the weight of the vent pipe.

Horizontal runs must slope downwards not less than ¼ inch per foot from the unit to the vent terminal.

Robur GAHP-W and W LB units are not allowed to be vented into a common horizontal vent system, unless the common vent system is properly designed by the vent manufacturer or a qualified engineer.

When common venting Robur GAHP-W and W LB fan-assisted units with other appliances through one shared duct called a “common vent”, special care must be taken by the installer to ensure safe operation. In the event that the common vent is blocked, it is possible, especially for fan-assisted devices, to vent backwards through non-operating appliances sharing the vent, allowing combustion products to infiltrate occupied spaces.

If the appliances are allowed to operate in this condition, serious injury or death may occur.

Operation of appliances with a blocked common vent may lead to serious injury or death. Safety devices must be implemented to prevent blocked common vent operation. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of leakage of flue gasses into living spaces, common venting must not be applied, and appliances should each be vented separately.

It is for this reason that, in addition to following proper vent sizing, construction and safety requirements from the National Fuel Gas Code, ANSI Z223.1 or in Canada, from the Natural Gas and Propane Installation Code (CSA B149.1) as well as all applicable local codes, it is required that installers provide some means to prevent operation with a blocked common vent. It is suggested that a blocked vent safety system be employed such that if the switch from one appliance trips due to excessive stack spill or back pressure indicating a blocked vent condition, that all appliances attached to the vent be locked out and prevented from operating.

Note that the Robur GAHP-W and W LB units are equipped with a safety pressure switch, as shipped. However, this safety switch has only been designed and tested to be effective in installations where the Robur GAHP-W and W LB units are vented separately and NOT common vented with other appliances.

As an additional precaution, it is recommended that a Carbon Monoxide (CO) alarm be installed in all enclosed spaces containing combustion appliances.

Refer to the installation and operating instructions on all appliances to be common vented for instructions, warnings, restrictions and safety requirements. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gases into living spaces, common venting must not be applied, and appliances should each be vented separately.

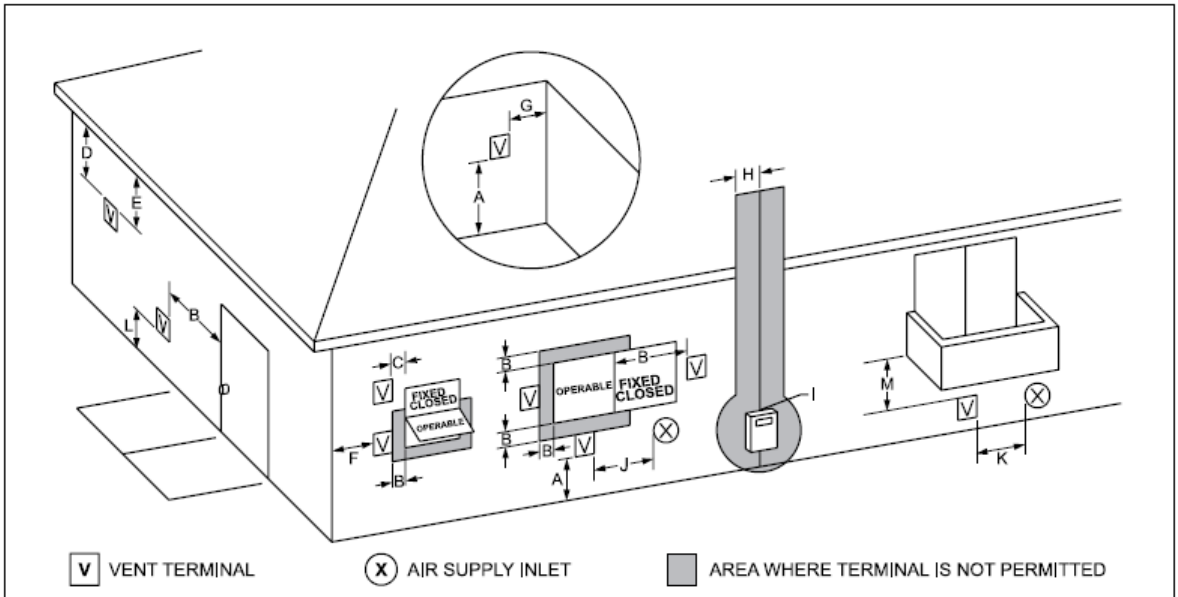
VENT TERMINAL

The terminal Must be located in accordance with ANSI Z223.1/NFPA 54 and applicable local codes. In Canada, the installation must be in accordance with CSA B149.1 and local applicable codes.

Consider the following when installing the vent terminal:

1. Locate the vent terminal so that vented gases cannot be drawn into air conditioning system inlets.
2. Locate the vent terminal so that vent gases cannot enter the building through doors, windows, gravity inlets or other openings. Whenever possible, locations under windows or near doors should be avoided.
3. Locate the vent terminal so that it cannot be blocked by snow. The installer may determine that a vent terminal must be higher than the minimum shown in codes, depending upon local conditions.
4. Locate the terminal with a minimum horizontal clearance of 4 feet from electric meters, gas meters, regulators and relief equipment.
5. Locate the terminal so the vented exhaust does not settle on building surfaces or other nearby objects. Vented products may damage such surfaces or objects.

The outdoor vent terminal will become hot. Unit must be installed in such a way as to reduce the risk of burns from contact with the vent terminal.



U.S. Installations (see note 1)	Canadian Installations (see note 2)	
A= Clearance above grade, veranda, porch, deck, or balcony	12 inches (30 cm)	12 inches (30 cm)
B= Clearance to window or door that may be opened	Direct Vent Only: 12 inches (30 cm) Other Than Direct Vent: 4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening	36 inches (91 cm)
C= Clearance to permanently closed window	See note 4	See note 5
D= Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61cm) from the center line of the terminal	See note 4	See note 5
E= Clearance to unventilated soffit	See note 4	See note 5
F= Clearance to outside corner	See note 4	See note 5
G= Clearance to inside corner	See note 4	See note 5
H= Clearance to each side of center line extended above meter/regulator assembly	See note 4	3 feet (91 cm) within a height 15 feet above the meter/regulator assembly
I= Clearance to service regulator vent outlet	See note 4	3 feet (91 cm)
J= Clearance to non mechanical air supply inlet to building or the combustion air inlet to any other appliance	Direct Vent Only: 12 inches (30 cm) Other Than Direct Vent: 4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening	36 inches (91 cm)
K= Clearance to a mechanical air supply inlet	3 feet (91 cm) above if within 10 feet (3 m) horizontally	6 feet (1.83 m)
L= Clearance above paved sidewalk or paved driveway located on public property	Vent termination not allowed in this location	Vent termination not allowed in this location
M= Clearance under veranda, porch, deck, or balcony	See note 4	12 inches (30 cm) (see note 3)

Notes:
1. In accordance with the current ANSI Z223.1 / NFPA 54 National Fuel Gas Code.
2. In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code.
3. Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.
4. For clearances not specified in ANSI Z223.1 / NFPA 54, clearance is in accordance with local installation codes and the requirements of the gas supplier.
5. For clearances not specified in CSA B149.1, clearance is in accordance with local installation codes and the requirements of the gas supplier.

Figure 8

INSTALLATION OF CARBON MONOXIDE DETECTORS

The installing contractor shall observe that a hard-wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing contractor hall observe that a battery operated or hard-wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the vented gas fueled equipment.

It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard-wired carbon monoxide detectors.

In the event that these requirements cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

2.7 GAS SUPPLY AND PIPING

Gas piping must conform to the latest edition of **National Fuel Gas Code ANSI Z223.1** and to all local gas piping codes. In Canada, the gas piping must conform to the **CGA Standard CAN1 B149.1 and .2, "Installation Code for Gas Burning Appliances & Equipment"** and local codes.

All threaded joints must be coated with a pipe sealing compound resistant to action of liquefied petroleum gas. An approved union must be installed in the gas line near the unit and down stream of any external shut-off valve that may be required by local codes.

Verify that the appliance is fitted for the proper type of gas by checking the rating plate. Robur GAHP-W and W LB units are designed to operate with either natural gas or L.P.G.

Locate and install manual shutoff valves in accordance with state and local requirements. A sediment trap must be provided upstream of the gas controls.

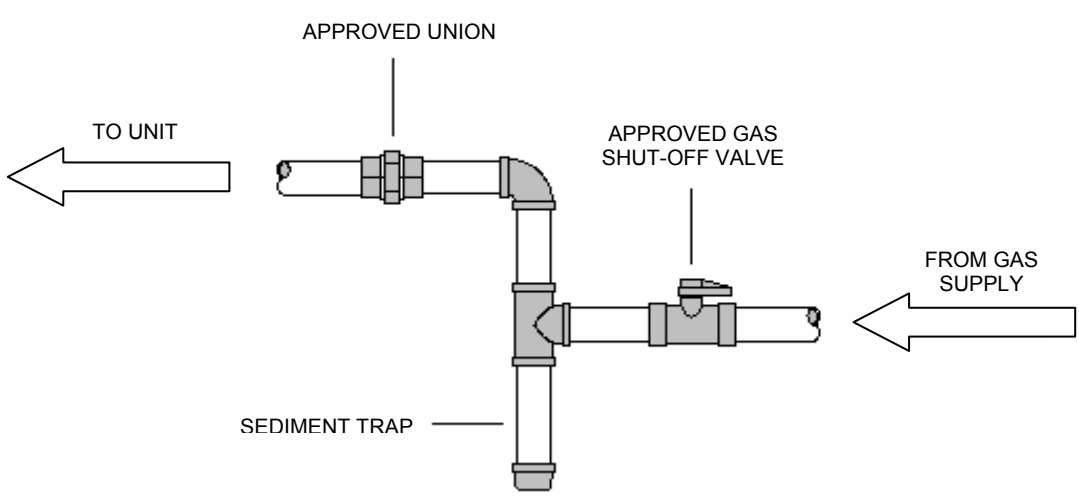


Figure 9 - Gas connection

The unit and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of the gas piping system at test pressures **in excess of 1/2 PSIg.**

The unit must be isolated from the gas supply piping system by closing its individual shut-off valve during any pressure testing of the gas piping system at test pressures **equal to or less than 1/2 PSIg.**

The appliance and its gas connection must be leak tested before placing it in operation. Purge all air from gas lines.

Do not use an open flame to check for leaks. An open flame could lead to explosion, which could result in property damage, serious injury or death.

Vertical gas pipes must be equipped with a siphon with a drain for the condensate. It may also be necessary to insulate the gas pipe to prevent the formation of excessive condensate.

Supplying gas to the appliance at higher pressures than those indicated above can damage the gas valve, which could result in property damage, serious injury or death.

This appliance is orificed for operation up to 3,000 feet altitude. Consult the factory for installations above 3,000 feet elevation. Conversions for operation at high altitude must be performed by factory authorized personnel only.

INLET GAS PRESSURE

For natural gas the maximum inlet gas pressure must not exceed 14” w.c.

The minimum inlet gas pressure is 5” w.c.

For LPG the maximum inlet gas pressure must not exceed 14” w.c. The minimum inlet gas pressure is 11” w.c.

MANIFOLD GAS PRESSURE

BTU CONTENT PER CU.FT.	SPECIFIC GRAVITY OF NATURAL GAS			
	0,55	0,6	0,65	0,7
950	3,15	3,43	3,72	4,01
975	2,99	3,26	3,53	3,80
1000	2,84	3,10	3,36	3,61
1025	2,70	2,95	3,20	3,44
1050	2,58	2,81	3,04	3,28
1075	2,46	2,68	2,90	3,13
1100	2,35	2,56	2,77	2,99
1125	2,24	2,45	2,65	2,86

OUR REFERENCE:

BTU CONTENT PER CU.FT.	SPECIFIC GRAVITY OF NATURAL GAS
	0,555
1014	2,8 IN. W.C.

Table 13 - Manifold pressure based on gas input of 95,500 Btu/hr USING 0.21” orifice.

GAS TYPE	NATURAL GAS	LP GAS
MANIFOLD PRESSURE	2.8 WC INCHES	5.1 WC INCHES
NOZZLE DIAMETER	0.21”	0.14”

Table 14 - Manifold pressure and nozzle diameter.

MANIFOLD GAS PRESSURE ADJUSTMENT PROCEDURE

1. Ensure that all air is properly bled from the gas line before starting the ignition sequence. Start-up without properly bleeding air from the gas line may require multiple reset functions of the ignition control module to achieve proper ignition.
2. Turn the gas valve knob to the “OFF” position.
3. Remove the hex plug located on the outlet side of the gas valve and install a fitting suitable to connect to a manometer.
4. Turn the gas valve knob to the “ON” position.
5. Switch the unit “ON” and call for heat.
6. The gas valve will open at the end of the trial for ignition stage and remain open as the burner fires. If air has not been completely bled, ignition process may fail requiring a manual reset (See 4.4 on page 51).
7. When the burner ignites, read the manometer and compare the number to the required pressure in Table 13 or Table 14.
8. If necessary, remove the seal screw and turn the regulator adjustement screw clockwise to raise the pressure, counterclockwise to lower the pressure.
9. Replace the seal screw when the correct pressure has been set.
10. Switch the unit OFF.
11. Turn the gas valve knob to the “OFF” position.
12. Remove the manometer and replace the hex plug in the gas valve.
13. Turn the gas valve knob to the “ON” position.
14. Switch the unit “ON” and check for leaks at all gas connections with soap.

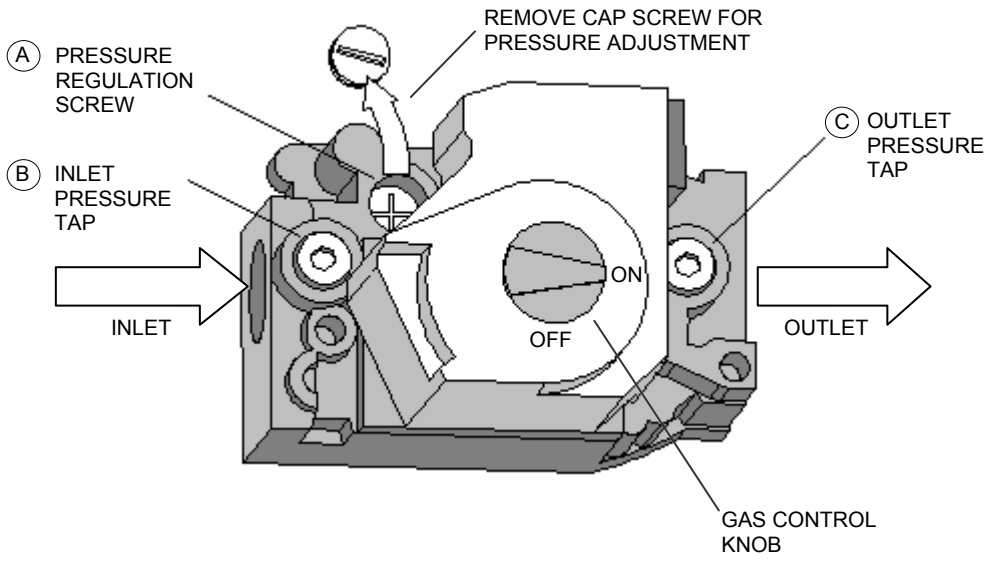


Figure 10 - Gas valve

2.8 WATER CONNECTIONS

Piping should be supported by suitable hangers or floor stands. Do not support piping with this appliance. Due to expansion and contraction of copper pipe, consideration should be given to the type of hangers used. Rigid hangers may transmit noise through the system resulting from the piping sliding in the hangers.

Use stainless steel, black steel, copper or cross linked polyethylene pipes for heating/chilling plants. All water pipes and pipe connections must be insulated in accordance with current regulations.

When rigid pipes are used, to prevent the transmission of vibrations, it is recommended that the appliance inlet and outlet water lines are connected with vibration dampings.

Power outage or the, interruption of gas supply may prevent theGAHP unit from firing. **Any time a GAHP unit is subjected to freezing conditions, and it is not able to fire, and/or the water is not able to circulate, there is a risk of water freezing in the GAHP unit or in the pipes in the system.** When water freezes, it expands. This can result in bursting of pipes in the system, which could result in leaking or flooding conditions.

Permanent inhibited antifreeze/glycol must be added to the hydronic loop.

A minimum 10% concentration is required in all regions.

Robur recommends the use of permenantlyinhibited propylene glycol. Maintaining the level of inhibitor in the glycol is also required and must be checked annually.

Zinc coated steel must not be used in the water loop piping especially if there is antifreeze/glycol.

Different glycol products may provide varying degrees of protection. Glycol products must be maintained properly in a heating system, or they may become ineffective. Consult the glycol specifications, or the glycol manufacturer, for information about specific products, maintenance of solutions, and set up according to your particular conditions.

Never use automotive glycol (automotive antifreeze).

Glycol is denser than water and changes the viscosity of the system. The addition of glycol will decrease the heat transfer and increase the frictional loss in the heat pump and related piping. A larger pump with more capacity may be required to maintain the desired flow rates in a glycol system.

The following table has to be considered in order to correctrly size the pipes and the water pumps.

PROPYLENE GLYCOL CAPACITY CORRECTION FACTOR TABLE							
Percent Propylene Glycol	15%	20%	25%	30%	35%	40%	50%
Approximate Freezing Point In °F	24°	18°	15°	9°	5°	-5°	-30°
Capacity Factor Multiplier *	0.992	0.986	0.972	0.960	0.950	0.928	0.878
Pressure Drop Multiplier **	1.04	1.08	1.13	1.21	1.26	1.47	2.79

Table 15 - Approximate water freezing point temperatures. The value are strongly affected by the type of antifreeze/glycol used.

PROPYLENE GLYCOL CAPACITY CORRECTION FACTOR TABLE							
Percent Propylene Glycol	15%	20%	25%	30%	35%	40%	50%
Approximate Freezing Point In °F	25°	21°	17°	11°	5°	0°	-10°
Capacity Factor Multiplier *	0.98	0.96	0.95	0.93	0.92	0.91	0.89
Pressure Drop Multiplier **	1.08	1.11	1.16	1.21	1.27	1.32	1.38

* At Standard ARI 590 conditions: 54°F entering fluid temperature, 44°F leaving fluid temperature, 95°F ambient temperature, 0.0005 fouling

** Pressure Drops may vary with individual glycol manufacturer's products. The information provided for pressure drop is typical but installing contractor / project engineer is responsible for verification of pressure drop correction based on specifications of glycol used.

Table 16 - Approximate water freezing point temperatures. The value are strongly affected by the type of antifreeze/glycol used.

The manufacturer will not be held responsible or liable for any damage caused by incorrect use or disposal of the glycol/antifreeze.

EXAMPLE OF TYPICAL HYDRAULIC PLANT SCHEME FOR GAHP-W APPLIANCE

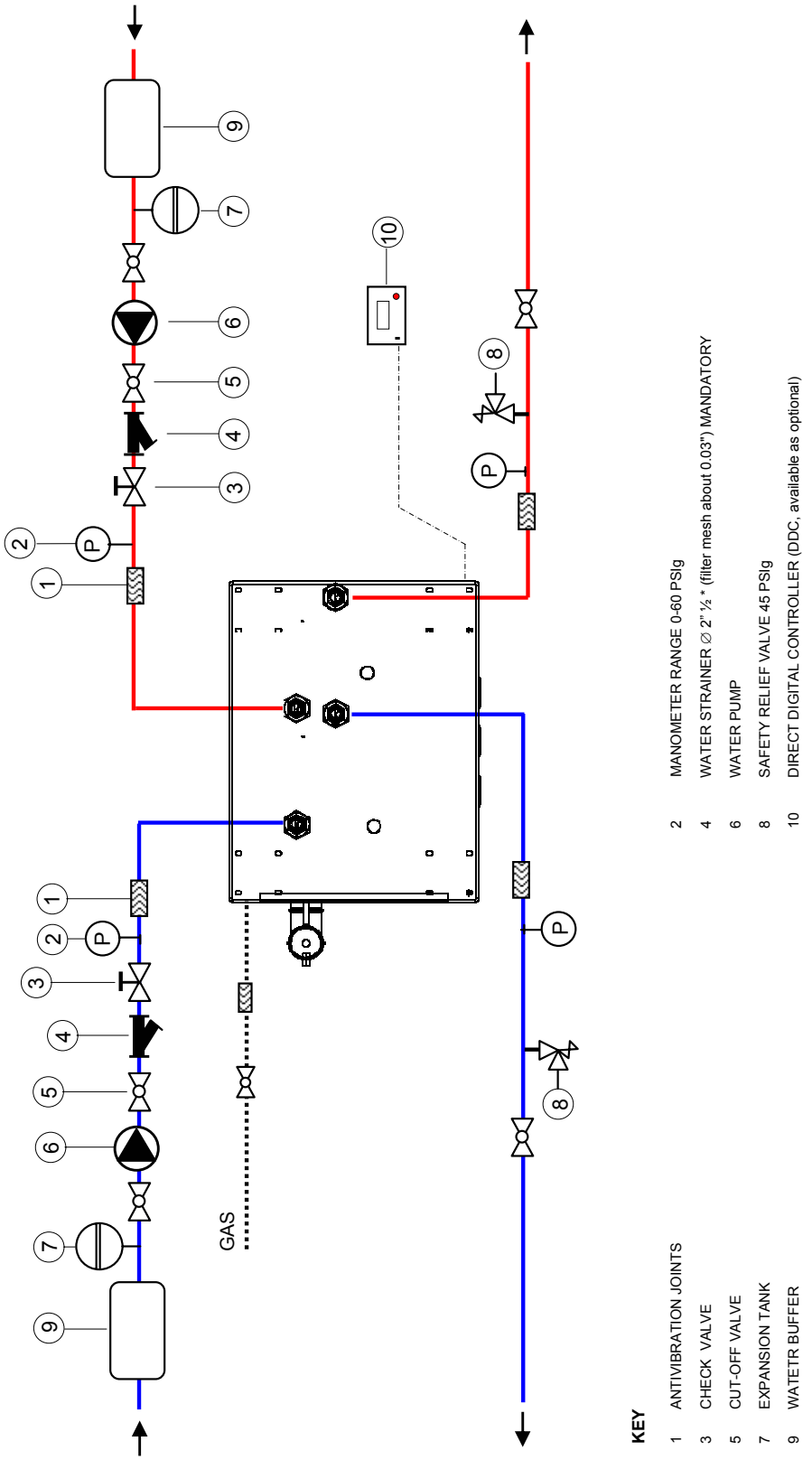

GAS
KEY
1 ANTIVIBRATION JOINTS
2 MANOMETER RANGE 0-60 PSIg
3 CHECK VALVE
4 WATER STRAINER ∅ 2" ½ " (filter mesh about 0.03") MANDATORY
5 CUT-OFF VALVE
6 WATER PUMP
7 EXPANSION TANK
8 SAFETY RELIEF VALVE 45 PSIg
9 WATETR BUFFER
10 DIRECT DIGITAL CONTROLLER (DDC, available as optional)

Figure 11 - Example of hydraulic plant diagram for GAHP-W connection

The appliance is not equipped with any expansion tank. It is necessary to install a properly sized expansion tank.

The water pumps must be installed on the inlet (to the unit) water line.

The installation of the water strainer is mandatory. The manufacturer will not be held responsible or liable for any damage caused by the absence of this component.

If an automatic filling system is used, a seasonal check of the antifreeze concentration or glycol fill device is recommended.

The unit has not been designed to produce direct DHW. For this purpose a dedicated boiler, built and installed according to CSA 1.91-1992 code and following revisions and to any local codes, has to be used.

FILLING THE SYSTEM (to be carried out by an authorized contractor/installer)

1. Ensure the system is fully connected. Close all air bleed devices and open make-up water valve. Allow system to fill slowly.
2. Open air bleed devices on all radiator units at the high points in the piping throughout the system, unless automatic air bleeders are provided at such points.
3. Fill the system adding antifreeze/glycol if necessary. See Table 15 and Table 16, on page 27.
4. Run the water pumps for a minimum of 15 minutes with the GAHP unit shut off.
5. Open all strainers in the circulating system, check flow switch operation, and check for debris. If debris is present, clean out to ensure proper circulation.
6. Check liquid level in expansion tank. With the system full of water and under normal operating pressure, the level of water in the expansion tank should not exceed ¼ of the total, with the balance filled with air. The pressure of the water in the system must not be lower than 14.5 PSIg and not higher than 45 PSIg.
7. Start up the GAHP unit according to the procedure in this manual.
8. Operate the entire system for one (1) hour.
9. Recheck the water level in the expansion tank. If the water level exceeds ¼ of the volume of the expansion tank, open the tank drain, and drain to that level.
10. Shut down the entire system and vent all radiator units at the highest point.
11. Within three (3) days of start-up, recheck all air bleeds and the expansion tank as described above.

The installer is responsible for identifying to the owner/operator the location of all emergency shutoff devices.

In order to prevent any possible problem due to a poor quality of the system water, refer to the **applicable codes and standards** about water treatment for HVAC installations.

Refer to the following table for the water quality.

CHEMICAL AND PHYSICAL PARAMETERS OF WATER IN HAETING/COOLING SYSTEMS		
PARAMETER	**UNIT OF MEASUREMENT**	**ALLOWABLE RANGE**
pH	\	> 7 (1)
CHLORIDES	ppm	< 125
TOTAL HARDNESS ($CaCO_3$)	°f	< 15
IRON	ppm	< 0.5 (1)
COPPER	ppm	< 0.1 (1)
ALUMINIUM	ppm	< 1
LANGELIER'S INDEX	\	0 – 0.4
HARMFUL SUBSTANCES		
FREE CHLORINE	ppm	< 0.2 (1)
FLUORIDES	ppm	< 1
SULPHIDES		ABSENT

(1) In accordance and respecting current and local regulation

Table 17 – Chemical and physical parameters of water.

It is recommended to check regularly the water quality, especially if there is an automatic filling system. Water reintegration should not exceed 5% per year of the total amount of water.

If water treatment is required, this operation should be carried out by a certified contractor/installer and the water quality has to be compliant with Table 17 following strictly the instructions by the manufacturer or supplier of the chemical substances for the treatment, since dangers could arise for health, for the environment and for Robur appliances.

Several water treatment products are available on the market.

In the case washing of the pipes is needed, this operation should be carried out by a professional or competent person, following strictly the instructions by the manufacturer or supplier of the chemical substances for the washing, avoiding the use of harmful substances for stainless steel or containing/releasing active chlorine.

Please make sure the pipes are properly rinsed in order to remove any residue of chemical substances from the pipes.

Robur is not liable for ensuring that water quality is always compliant with what is reported in Table 17. Non-compliance with indications above may jeopardize the proper operation, integrity and reliability of Robur appliances, voiding the warranty.

For any further detail, please contact the Robur Corporation located in Evansville, IN Phone (812) 424-1800; Fax (812) 422-5117.

2.9 DUCTING OF THE SAFETY VALVE

As the Robur GAHP-W and W LB units are intended for indoor installation only, it is mandatory to duct to the outdoors the safety valve in order to prevent dangerous situations inside the room.

If the ducting system is not installed the start up of the unit will not be performed.

Connect the ducting system to hole E (see Figure 2 at page 15) on the top panel of the unit.

Do not install any valve in the ducting system. The manufacturer does not accept any contractual or extra-contractual liability for any damage caused by improper installation of the ducting system.

1. Remove the plastic cap on the top panel (detail E of Figure 2 at page 15).
2. Connect to hole E a stainless steel pipe (do not use copper or copper alloys). The minimum straight length is 12 in. The maximum length of the pipe is indicated in Table 19. Be sure to install the Teflon gasket provided.

Figure 12

a) Locate the vent terminal so that the gas cannot be drawn into air conditioning system inlets.

b) Locate the vent terminal so that the gas cannot enter the building through doors, windows, gravity inlets or other openings.

c) Locate the vent terminal so that it cannot be blocked by snow.

d) Locate the terminal with a minimum horizontal clearance of 4 feet from electric meters, gas meters, regulators and relief equipment.

DIAMETER	MAXIMUM LENGTH
1” ¼	100 ft
2”	200 ft

Table 18 - Maximum pipe length

SECTION 3 ELECTRICAL CONNECTIONS

The appliance must be electrically grounded in accordance with the requirements of the local building authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code, ANSI/NFPA 70, in the U.S. and with latest edition of CSA C22.1 Canadian Electrical Code, Part 1, in Canada. Do not rely on the gas or water piping to ground the metal parts of the Robur GAHP units. Plastic pipe or dielectric unions may isolate the Robur GAHP electrically. Service and maintenance personnel, who work on or around the unit, may be standing on wet floors and could be electrocuted by an ungrounded unit.

This product must be installed and serviced by a qualified installer.

In the following section please refer to "L" as "L1" and to "N" as "L2".

Installation that does not comply with current legislation may cause damage to people, animals or things; Robur Corporation is not responsible for any damage caused by wrong installation.

Line voltage wire exterior to the appliance must be enclosed in approved conduit or approved metal clad cable.

3.1 S61 AND ROBUR ELECTRICAL DIAGRAM KEY

S61 electronic control board key

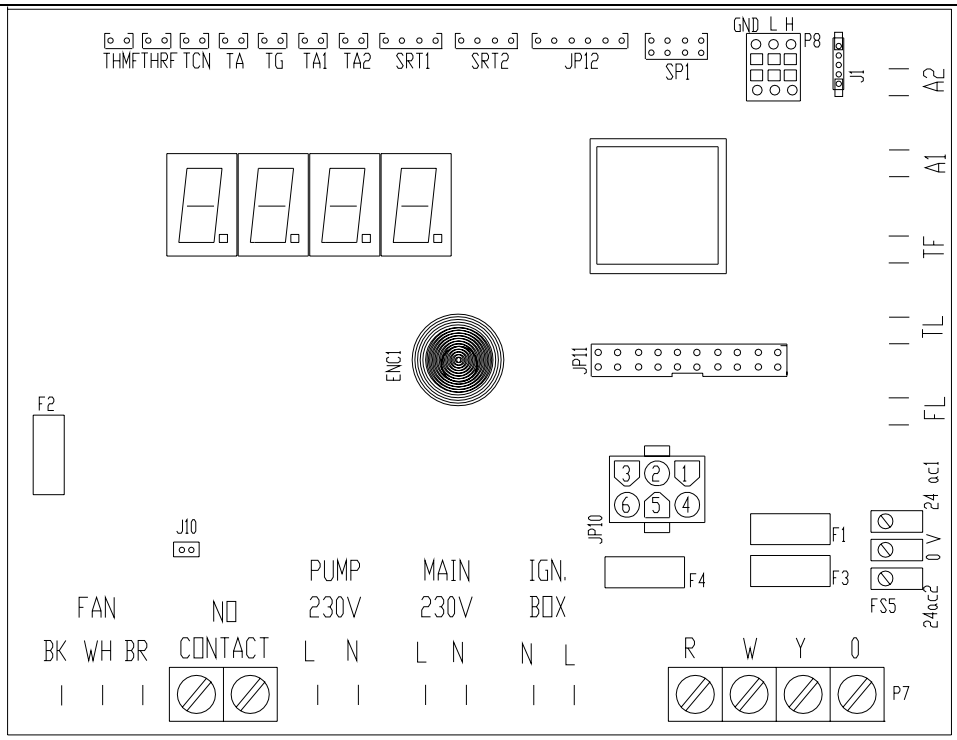


Figure 13 - S61 electronic control board key.

TOP EDGE		BOTTOM EDGE	
THMF	OUTLET WATER TEMPERATURE PROBE	FAN (BK, WH, BR)	FAN MOTOR ELECTRICAL SUPPLY (BLACK, WHITE, BROWN)
THRF	INLET WATER TEMPERATURE PROBE	N.O. CONTACT	NORMALLY OPEN CONTACT FOR WATER PUMP (MAX 4A)
TCN	CONDENSER TEMPERATURE PROBE	PUMP 230V (L, N)	OIL PUMP ELECTRICAL SUPPLY
TA	OUTDOOR TEMPERATURE PROBE	MAIN 230V (L,N)	MAIN POWER
TG	GENERATOR TEMPERATURE PROBE	IGN. BOX (L, N)	IGNITION CONTROL BOX
TA1	AUXILIARY PROBE 1 - NOT USED	J10	N.O. CONTACT JUMPER
TA2	AUXILIARY PROBE 2 – NOT USED	P7 (R, W, Y, O)	ON-OF SWITCH
SRT1	OIL PUMP ROTATION SENSOR	**LEFT AND RIGHT EDGE**	
SRT2	NOT USED	F2	FUSE
SP1	NOT USED	FS5 (24V AC)	24 V SUPPLY
P8 (GND, L, H)	CAN BUS CONNECTOR	FL	FLOW SWITCH CONTACT
J1	CAN BUS JUMPERS	JP12	NOT USED
INNER ZONE		TL	GENERATOR TEMPERATURE THERMOSTAT
ENC1	ENCODER	TF	FLUE GAS TEMPERATURE THERMOSTAT
JP11	AUX BOARD CONNECTOR NOT USED	A1, A2	AUXILIARY CONNECTORS NOT USED
		JP10	6-POLE CONNECTOR

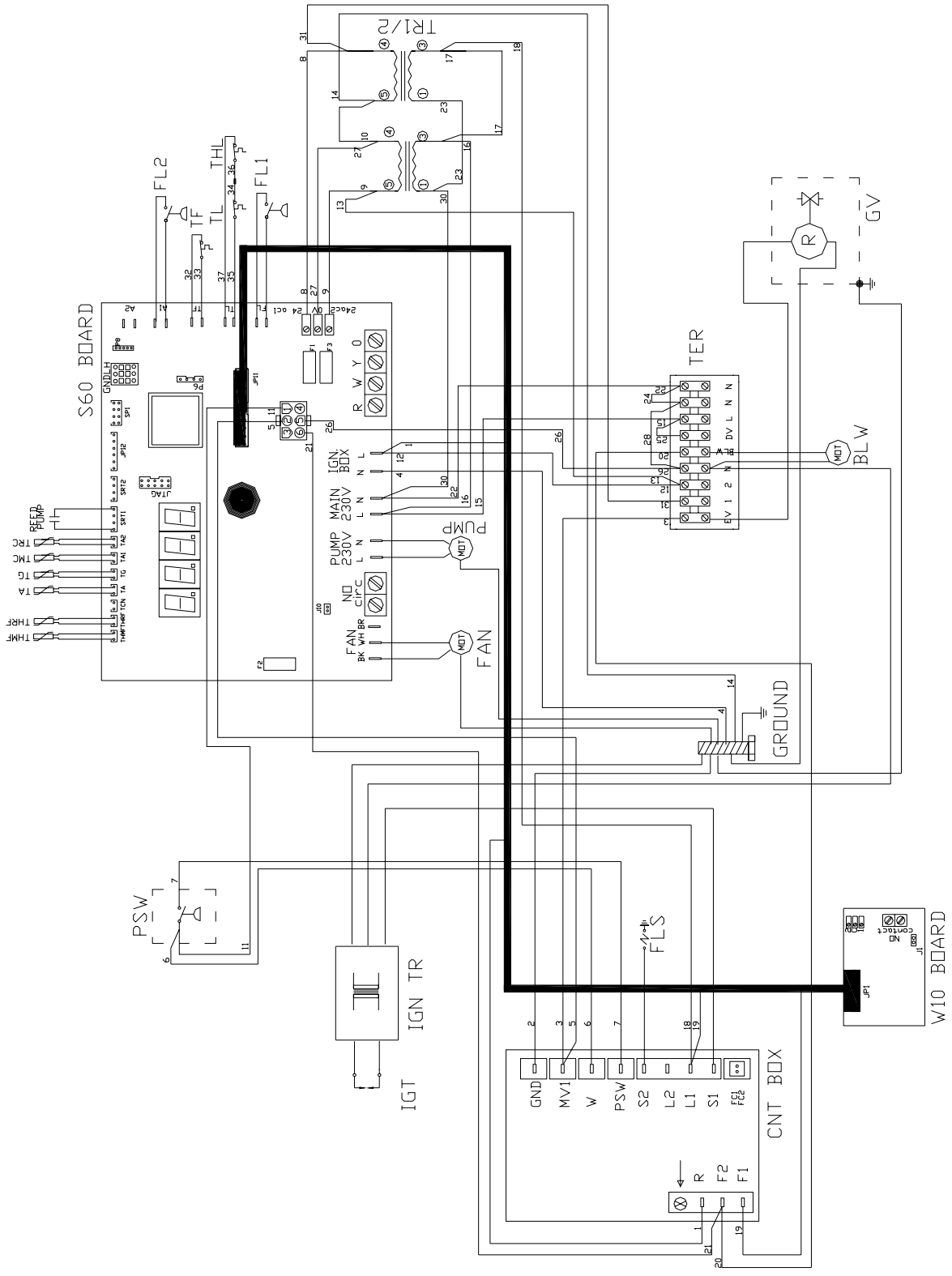


Figure 14 - Internal electrical wiring diagram

Robur electric diagram key

SYMBOL	DESCRIPTION
R-W	Heating on-off switch (24 V out)
R-Y	Cooling on-off switch
0	Not used (24 V out)
L	Hot 230V Hot wire
N	Neutral Wire
GROUND	Ground
C	Capacitor
F	Fuse
CS	On-off switch
GS	Main switch
PY	Cooling water pump
PW	Heating water pump
PWRTR	230/24V transformer
DDCTR	230/24V transformer
IGNTR	Ignition Transformer
PTR	Water Pump Transformer
MV	Motor Valve
DV	Defrosting Valve
GV	Gas Valve
DDC	Direct Digital Controller
CNTBOX	Flame Control Box
BLW	Blower
PSW	Air Pressure Switch
IGN	Ignition Electrode
FLS	Flame sensor
FAN	Fan
TER	Terminal Board
PMP	Pump
KP	Relay for Water Pump Control – not supplied
IP	Water Pump Bipolar Electrical Disconnection Switch – not supplied
MC	Micro switch - Heater side
MF	Micro switch - Chiller side
THL	Water Thermostat

Table 19 - GAHP-W electric diagram key.

3.2 OPERATION OF THE APPLIANCE THROUGH R-W-Y CONTACTS ON THE ELECTRONIC BOARD (WITHOUT ROBUR OPTIONAL DIRECT DIGITAL CONTROLLER - DDC)

Before doing any electrical connection, make sure that the unit is not powered.

Do not switch on and off the unit using the main switch indicated with the symbol GS in Figure 15.

Label the wires you need to disconnect during service. Wiring errors can cause improper and dangerous operation.

1. Connect the main line to the appliance as indicate in the Figure 15.
   Check that the main line is 208-230 V 1ph - 60 Hz.
   Keep to polarità.
2. Use a 3x16 AWG cable; 2 x 5A fuses T type OR or a 10 A circuit breaker switch.

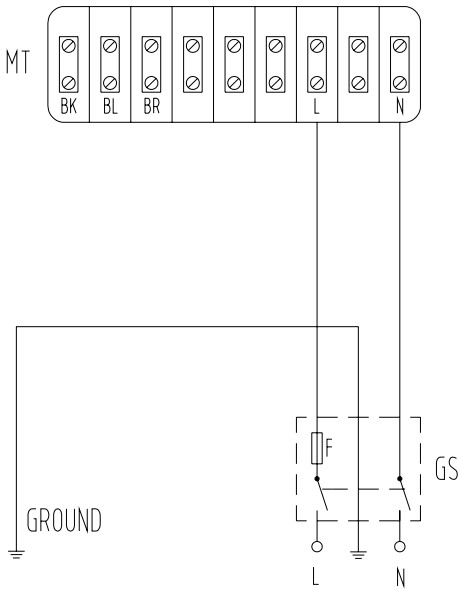


Figure 15 - Main line conection

3. Connect the on/off switch (for example a thermostat) to the terminals **R, W** and **Y** of the electronic board as shown in Figure 16.
   - If the unit is in heating mode/priority (see Page 45), switch on the appliance closing the R-W contact (See Figure 16).
   - If the unit is in the cooling mode priority (see Page 45), switch on the appliance closing R-Y contact (See Figure 16).
   - If the unit has no priority (see see Page 45), switch on the appliance closing either R-Y or R-W contact.

The operations mentioned above are not necessary if a Direct Digital Controller (DDC) is installed. The on-off signal comes directly from the DDC.

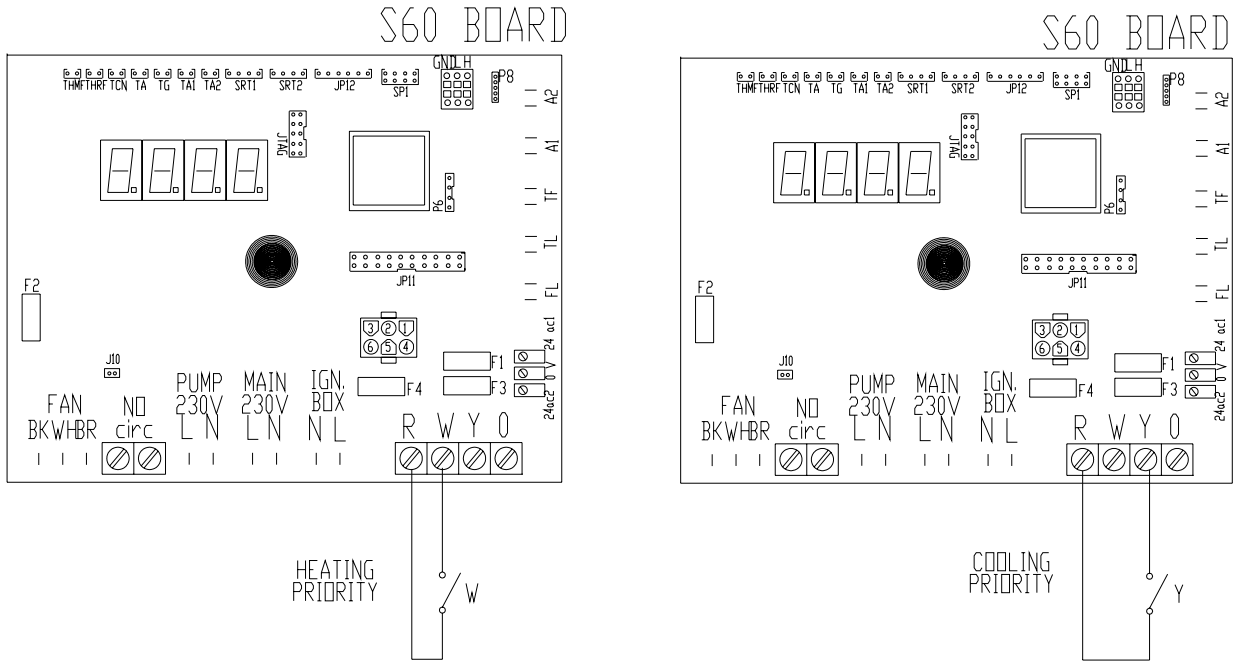


Figure 16 - On-off switch connection.

4. Connect the heating and cooling water pumps.
   - If the electrical consumption of each water pump (heating and cooling) is lower than 4A, the pumps can be connected directly to the N.O. contacts on the board.
     PY is the cooling water pump.
     PW is the heating water pump.
     Close the jumpers J10.

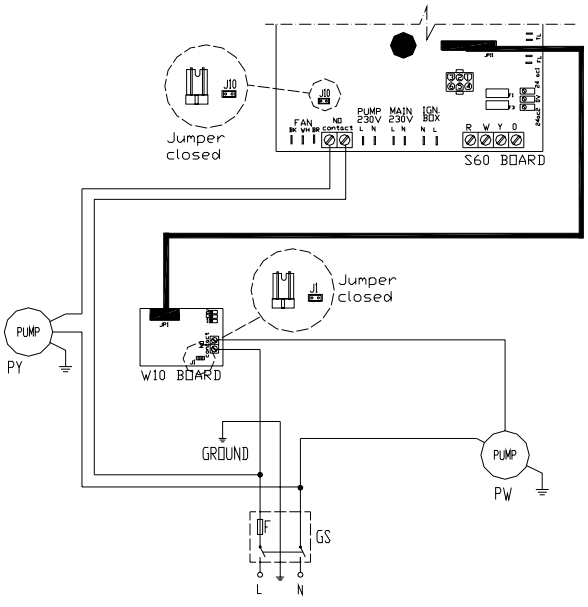


Figure 17 - Connection of water pumps with electrical consumption lower than 4A

- If the electrical consumption of each water pump (heating and cooling) is higher than 4A, the pumps must be connected using two relays.
  PY is the cooling water pump, R2 is the cooling pump relay.
  PW is the heating water pump, R1 is the heating pump relay.
  Open the jumpers J10.

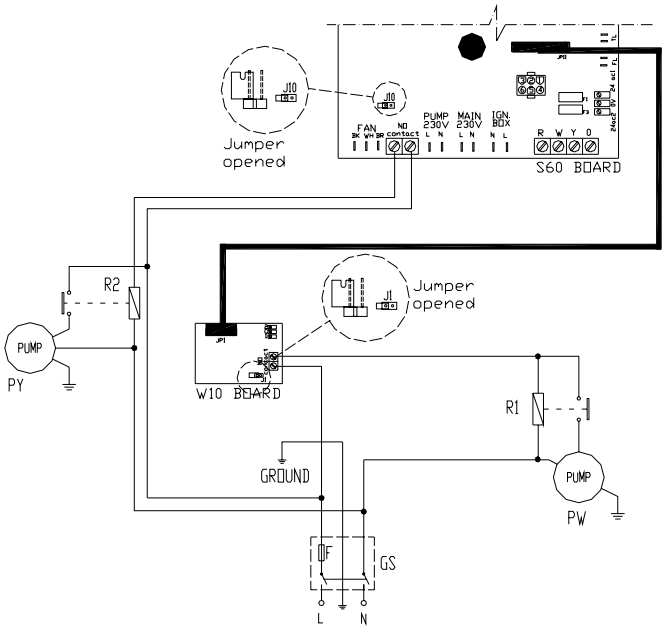


Figure 18 - Connection of water pumps with electrical consumption higher than 4A

- Example of water pump connections with more than one appliance.
  PY is the cooling water pump, KPY is the cooling pump relay
  PW is the heating water pump, KPW is the heating pump relay
  PTR is the Low Voltage transformer
  IP is the water pumps main switch
  Open the jumpers J10

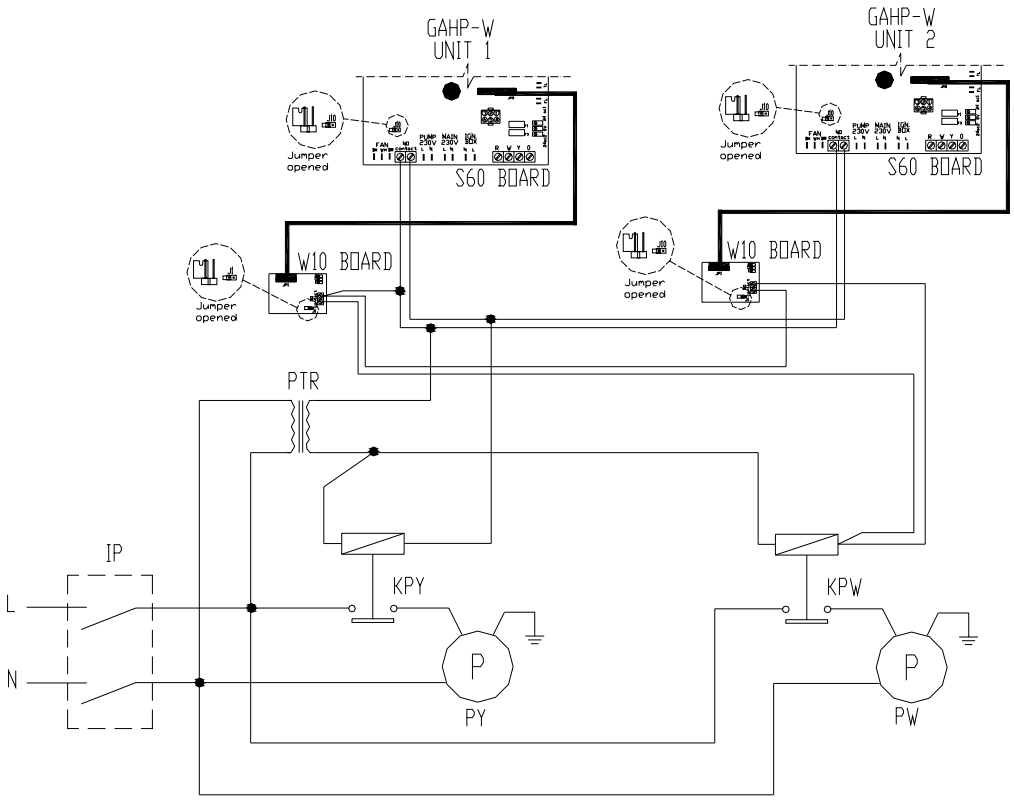


Figure 19 - Connection of water pumps with more than one appliance

3.3 OPERATION OF THE APPLIANCE THROUGH ROBUR DIRECT DIGITAL CONTROLLER (DDC)

Refer to the pertinent manuals for specific information on the DDC.

The appliance and the DDC are connected via a CAN-bus network.

Example of CAN-bus connections (see Figure 19):

1. One appliance (A) and one DDC. The two devices are “terminal” nodes.
2. Two (or more) appliances (A and B) and one DDC. Appliance “A” is a “terminal” node as well as the DDC. Appliance “B” is an “intermediate” node.

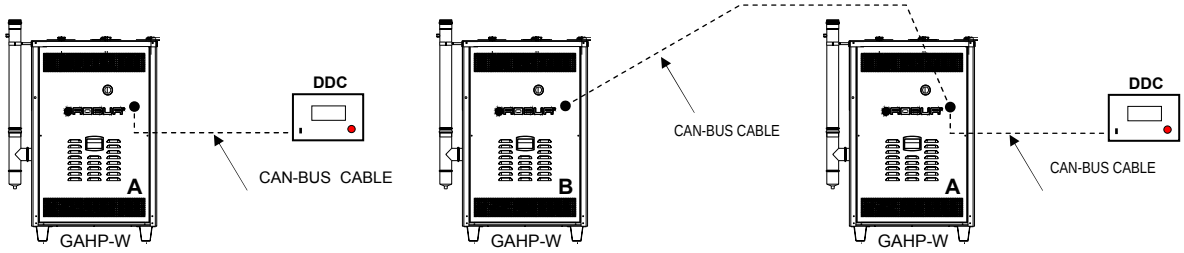


Figure 20 - Examples of CAN-bus connections

One DDC can control and up to 16 GAHP-W and W-LB units.
On the same CAN-bus line it is possible to connect up to three DDC’s (48 units

max).
The DDC can be installed anywhere in the CAN-bus line.

CAN-bus cable specifications

The CAN bus cable must meet the Honeywell SDS standard.
The installation of a cable which is not compliant with the Robur specifications will void the manufacturer's warranty.

Below is a table listing the cable types which meet the Robur specifications.

NAME OF CABLE	SIGNALS / COLOUR			MAX LENGTH	Note
Robur					
ROBUR NETBUS	H= BLACK	L= WHITE	GND= BROWN	450 m	- - - - - - - - -
Honeywell SDS 1620					
BELDEN 3086A	H= BLACK	L= WHITE	GND= BROWN	450 m	**In all cases, the 4th wire is not used**
TURCK type 530					
DeviceNet Mid Cable					
TURCK type 5711	H= BLUE	L= WHITE	GND= BLACK	450 m	
Honeywell SDS 2022					
TURCK type 531	H= BLACK	L= WHITE	GND= BROWN	200 m	

Table 20 - Example of types of cable that may be used for CAN bus connection

"GND" it is NOT a ground connection.

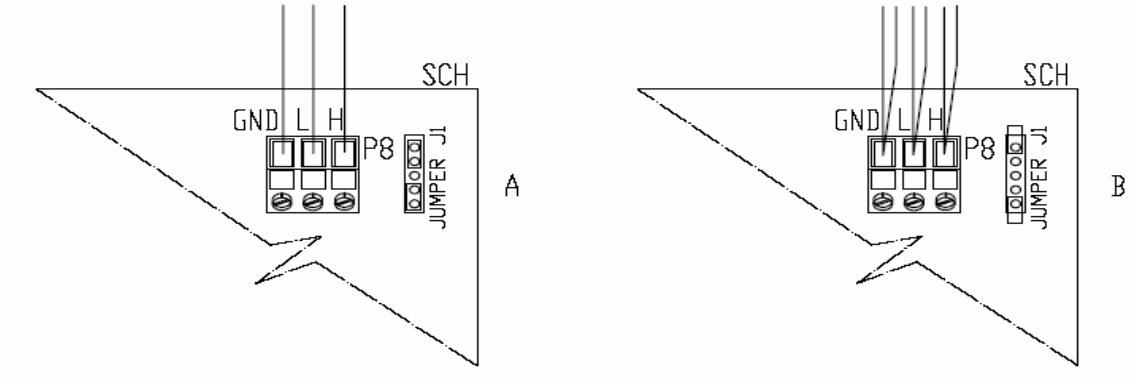
A shielded cable 3 x 18 AWG can be used ONLY if the total length of the CAN-bus cable is shorter than 650 ft. and if the nodes are less than 6.

Connection of the CAN-bus cable to the board of the appliance

Connect the CAN-bus cable to the appropriate connector (D) on the electronic board.

See Figure 22.

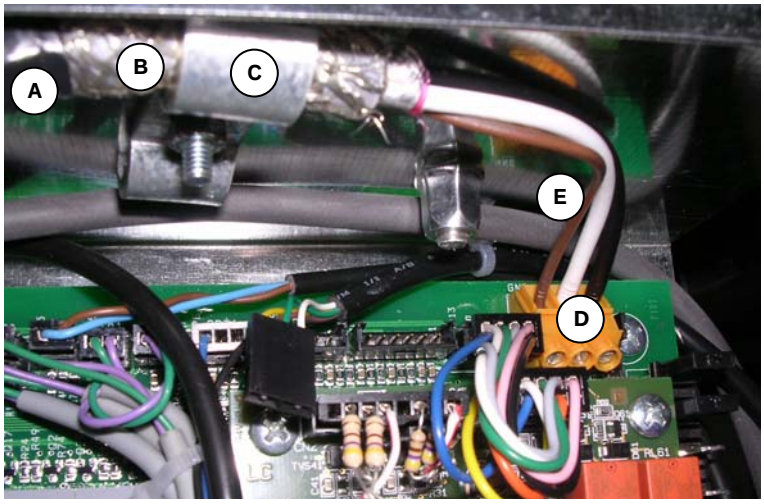
1. Remove the protection tape of the cable (approx. 3 inches). Do not damage the shield and the wires.
2. Pull back the shield and tape it as indicate in Figure 22 letter A.
3. Connect the wires in the CAN-bus connector D.
   - If the appliance is a "**terminal" node,** connect the cable as shown in Figure 21-A. Keep to the sequence L, H, GND. Close jumpers J1.
   - If the appliance is an "**intermediate node",** connect the cable as shown in Figure 21-B. Respect to the sequence L, H, GND. Open jumpers J1.
4. Fix the CAN bus cable to the clamp as indicate in Figure 22 letter C.



KEY

GND	Common signal
L	LOW signal
H	HIGH signal
J1	CAN BUS jumpers J1
A	“Terminal” node configuration - 3 wires - J1 closed
B	“Intermediate” node configuration - 6 wires - J1 open

Figure 21 - CAN-bus connection.



KEY

A Protection tape for the shield of the cable
B CAN-bus shield
C Fixing clamp
D Can-bus connector
E CAN-bus wires

Figure 22 - Example of a single CAN bus cable connected to the board (the appliance is a terminal node)

Connection of the CAN-bus cable to the DDC

Connect the CAN-bus cable to the appropriate connector supplied with the DDC.

1. Remove the cover of the DDC (Figure 24 letter D).
2. Remove the protection tape of the cable (approx. 3 inches). Do not damage the shield and the wires.
3. Roll the shield and connect it to the eyelet terminal as illustrated in Figure 24 letter C.
4. Connect the wires in the CAN-bus connector.
   - If the appliance is a “**terminal” node,** connect the cable as shown in Figure 25. Keep to the sequence L, H, GND. Close jumpers J1.

- If the appliance is an "**intermediate node",** connect the cable as shown in Figure 26. Respect to the sequence L, H, GND. Open jumpers J1.

5. Fix the CAN bus cable to the clamp as indicate in Figure 24 letter C.

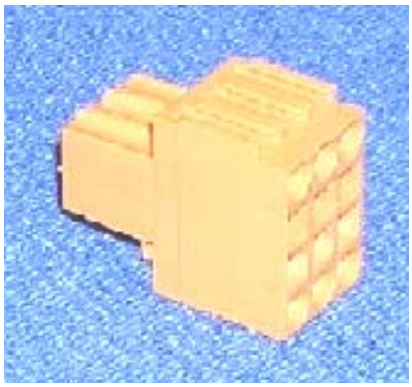
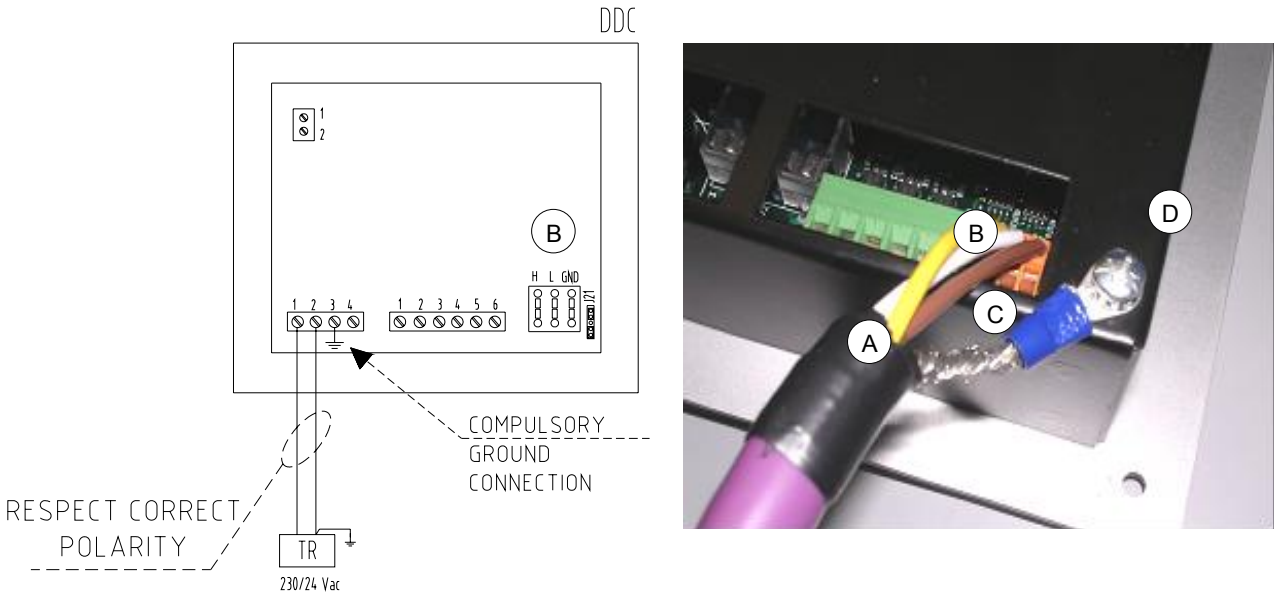


Figure 23 - CAN-bus Connector supplied with the DDC



KEY

GND	Common data	A	Insulating tape protecting CAN bus cable shield
L	LOW data signal	B	CAN bus wires
H	HIGH data signal	C	CAN bus cable shield
J21	jumpers (CLOSED)	D	Eyelet terminal and screw for fixing to base of DDC

Figure 24 - Direct Digital Controller (DDC) – wiring diagram and partial rear view

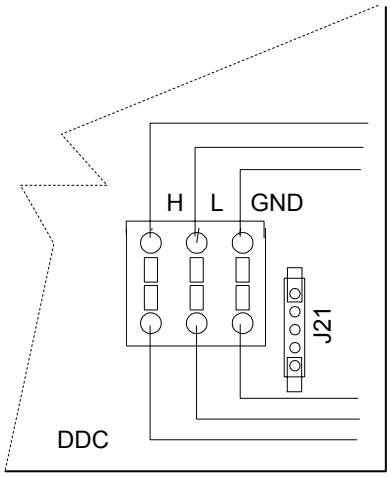


Figure 25 - CAN-bus connection to the DDC: “intermediate” node

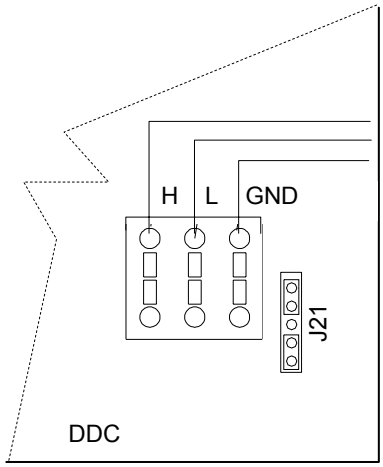


Figure 26 - CAN-bus connection to the DDC: “terminal” node

Supply Power to the DDC

The DDC requires a low voltage (24 V) power supply.

Install a dedicated 230/24 V, 60Hz safety transformer (minimum 20 VA).

Connect the DDC to the transformer using the 4-pole connector. See Figure 24.

- TERMINAL 1: 24 V
- TERMINAL 2: 0 V
- TERMINAL 3: GROUND (connect to a safety ground socket, r ≤ 0,1Ω)
- TERMINAL 4: Not used

The DDC is equipped with a backup battery in order to help avoid data loss.

3.4 OPERATION OF THE GAHP-W AND W-LB

Preliminary checks to be performed by the qualified installer. Proceed with the start-up only if the below conditions have been satisfied.

- the appliance is fitted for the proper type of gas by checking the rating plate. Robur GAHP-W and W LB units are designed to operate with either natural gas or L.P.G.

- sealing of the gas and water pipes.
- the gas supply pressure is within the rating limits indicated by the manufacturer.
- the gas and electric lines are equipped with all safety devices required by current regulations
- the unit is grounded in accordance with the requirements of the local building authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code, ANSI/NFPA 70, in the U.S. and with latest edition of CSA C22.1 Canadian Electrical Code, Part 1, in Canada.

Do not operate the Robur GAHP-W units if any electrical or safety components have been removed, by-passed or are not operatingdo not function correctly.

The start up of the Robur GAHP-W units can only be performed by a Robur Corporation authorized service or installing Company. The guidelines provided by the manufacturer must be followed.

The warranty of the GAHP-W units are efeffective only if validated by a Robur Corporation authorized service or installing Company.

If you smell gas:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Close the main shut off gas valve and electrically shut off the unit.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

In case of fault with no smell of gas:

- Shut down the unit through the R-W-Y contacts on the electronic board or through the DDC (if present). Do not switch off the unit through an electrical black out
- Wait till the shut down cycle of the unit is complete (10 minutes)
- Close the main shut off gas valve and electrically shut off the unit
- Do not try to fix the unit

The operating parameters are displayed on the 4-digit display of the electronic boad (S61) as well as on the display of the Direct Digital Controller (DDC) if installed.

The display shows in sequence the following temperatures:

- inlet cold water, outlet cold water, cold water ΔT
- outlet hot water, inlet hot water, hot water ΔT

Three different operation modes are available:

- Heating mode/priority: Robur unit operates only if there is heating demand. The goal is the heating water set-point and the unit stops only when it is satisfied. The cooling water set-point is not considered. Once the shut-down cycle is over, the chilled water pump stays on while the heating water pump stops.

- Cooling mode/priority: Robur unit operates only if there is cooling demand. The goal is the cooling water set-point and the unit stops only when it is satisfied. The heating water set-point is not considered.
  Once the shut-down cycle is over, the cooling water pump stays on while the heating water pump stops.
- No priority (mode not available with the DDC): Robur unit operates whether there is a cooling or heating demand. The goals are both the cooling and the heating water set-point and the unit stops when one of them is satisfied.
  Once the shut-down cycle is over both the heating and the cooling water pumps stay on.

SECTION 4 END USER

4.1 STARTING AND SHUTTING DOWN OF THE APPLIANCE

Refer to the Direct Digital Controller (DDC) manual, if the appliance is controlled by a DDC. In this case it is possible to switch on and shut down the unit only through the DDC.

If the appliance is not controlled by a DDC, it can be switched on and shut down through the on/off switch connected to the R-W-Y contacts on the electronic board (S61). See Figure 16 on page 38 according to the priotity mode choosen.

This on/off switch can be, for example, an on/off button, a thermostat, an aquastat, a timer, etc.

Do not switch on and off the appliance through an electrical black out.

1. Open the main shut off gas valve.
2. Power the appliance.
3. If no warning or error messages appear, the display of the electronic board (S61) shows in sequence the following temperatures:
    a. inlet cold water, outlet cold water, cold water ΔT
    b. outlet hot water, inlet hot water, hot water ΔT

The warning or error messages are shown on the display of the electronic board (S61) as well as on the display of the DDC (if installed). It is possible to reset the error and warning messages either through the electronic board or the DDC.

If these codes appears, follow the instructions in chapter 4.4 on page 51.

For a description of operating codes generated and how to reset them, refer to the list in chapter 4.9 on page 57.

4. Switch on the appliance though the DDC (if present) or through the on/off switch connected to the electronic board (S61).
5. Ignition cycle starts:
    a. The hydraulic pump, the heating and cooling water pumps and the pre-mix blower.
    b. If no error occurs, the unit tries to ignite after approximately 40 seconds.

    Air may be present in the gas pipes, if the unit has been off for a long time. In this case, the ignition may fail and the display of the electronic board will show U212 (warning 212).

    The unit will automatically reset the code and it will try to ignite two more times (three trials in total).

    If the ignition still fails after the 3 tries, the display will show E212 (error 212). The unit will not automatically reset the code.The unit will not automatically reset the code.

    To manually reset the code refer to chapter 4.4 on page 51.

If the error persists, contact an authorized Robur Service Company.

c. If the ignition does not fail, the unit should be in normal operation.

6. Switch off the appliance though the DDC (if present) or through the on/off switch connected to the electronic board (S61).
   a. The shut down cycle lasts approximately 10 minutes.

4.2 LONG INACTIVITY PERIOD

Operations to be performed by a qualified installer.

It is necessary to disconnect the appliance, if it has to be inactive for a long period.

1. Switch off the appliance though the DDC (if present) or through the on/off switch connected to the electronic board (S61). Wait till the shut down cycle is completed.
2. Switch off the power to the DDC (if present).
3. Switch off the power to the unit.
4. Close the main gas shut off valve.
5. Be sure there is the correct quantity of antifreeze in the primary loop if the unit has to be off during winter (see Table 15 and Table 16 at page 27).
   As an alternative, completely drain the primary water loop.

To re start the unit after a long inactivity period:

1. Fill the water loop if it has been drained.
2. Add antifreeze if necessary (see Table 15 and Table 16 at page 27) and properly pressurize the water loop (not lower than 14.5 PSI and not higher than 45 PSI).

If you smell gas, close the main gas shut off valve and call your gas supplier.

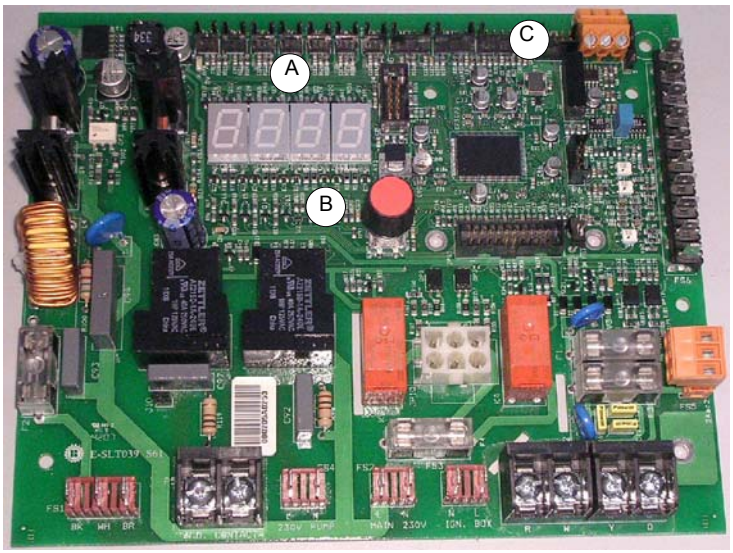
3. Switch on the power of the unit.
4. Switch on the power of the DDC (if present).
5. Switch on the unit.
6. Check that the correct water flow is guaranteed to the unit.
7. Switch on the appliance though the DDC (if present) or through the on/off switch connected to the electronic board (S61).
8. Check the water flow (see Table 2 on page 8).
9. Check the manifold gas pressure (See Table 13 on page 25).

4.3 ELECTRONIC BOARD

The following information refers to the electronic board with firmware version 3.023.

The appliance is equipped with two electronic boards:

- S61 with a microprocessor that controls the appliance and displays information, warning and error messages during the unit operation.



Electronic Control Board S 61

KEY
A 4 digit DISPLAY for data and codes visualization
B KNOB (encoder) to scroll/select operating data
C CAN PORT for the CAN-BUS cable connection

Figure 27 – S61 control board

- W10 that controls the heating water pump.

W10 peripheral board

Figure 28 – W10 peripheral board

Menu of S61 board

MENU	MENU DESCRIPTION	THE DISPLAY SHOWS
Menu 0	DATA/INFORMATION (READ ONLY)	0.
Menu 1	PARAMETERS (READ ONLY)	1.
Menu 2	RESET	2.
Menu 3	USER SETTINGS	3.
Menu 4	INSTALLER SETTINGS	4.
Menu 5	SERVICE SETTINGS	5.
Menu 6	ADVANCE SETTINGS	6.
Menu 7	DIGITAL INPUTS (READ ONLY)	7.
Menu 8	NOT USED	8.

Table 21 - Menu of electronic board

If the unit is electrically supplied the display shows, alternately, the following information:

- outlet cold water temperature, inlet cold water temperature, cold water ΔT
- outlet hot water temperature, inlet hot water temperature, hot water ΔT

Example:

INLET COLD WATER TEMPERATURE	
OUTLET COLD WATER TEMPERATURE	
COLD WATER ΔT	
OUTLET HOT WATER TEMPERATURE	
INLET HOT WATER TEMPERATURE	
HOT WATER ΔT	

Table 22 - Operating information example

If any warning or error occurs, the display shows, sequentially, the codes corresponding to the problem detected. A description of these codes is provided in chapter 4.9 - OPERATING CODES - TROUBLESHOOTING (firmware release 3.027) on page 57.

The encoder is used for surfing through the menus for setting the parameters.

To use the encoder:

1. Remove the front panel of the unit.
2. Remove the plug on the cover of the electric panel.
3. Rotate and press the encoder through the hole on the cover of the electric panel using the small pipe supplied with the unit.
   - Press the encoder to access the S61 menu list .
   - Rotate the encoder to scroll the menu. Choose the menu you want to access. Press “E” if you want to exit .
   - Press the encoder to enter the chosen menu .
   - Rotate the encoder to scroll parameters. Choose the parameter you want to edit. Press “E” if you want to exit.
   - Press the encoder to enter the chosen parameter .
   - Rotate the encoder to edit the value of the parameter (if it is not a “read only” parameter) .
   - Press the encoder to confirm the number and exit to the previous menu.

4.4 RESET

In order to reset warning or error messages it is necessary to enter menu 2 of the S61 board and choose the right number.

PARAMETER	DESCRIPTION	DISPLAY
0	IGNITION CONTROL BOX RESET (E212)	
1	OTHER WARNINGS/ERRORS RESET	
E	EXIT	

Table 23 - Menu for reset operations

1. In the electronic board main menu, press and rotate the encoder till the display shows the number 2 .
2. Press the encoder knob to access the menu. The display initially shows number (parameter)Parameter “0”, .
3. If you need to perform an ignition control box reset press the encoder.
   a. The display shows the following e flashing reset request:string: .
   b. Press the encoder knob again.
4. If you need to perform a general reset rotate the encoder till the display shows number (parameter) “1” and press the encoder.
   a. The display shows the following string: .
   b. Press the encoder to perform the reset.
5. Rotate the encoder till the display shows letter “E” and press it.
6. Rotate the encoder again till the display shows letter “E” and press it.

4.5 BASIC SET UP

The following operations described in this paragraph are necessary only if the appliance is not connected to a Direct Digital Controller (DDC).
If the appliance is connected to a DDC, refer to the DDC manual supplied.

The basic set up can be performed through menu 3 of the electronic board to configure the appliance. Access menu 3 of the electronic board.

Here a list of the parameters of menu 3.

HYDRAULIC PARAMETERDESCRIPTION	DISPLAY
COLD WATER TEMPERATURE THERMOSTAT CONTROLSELECT COLD WATER THERMOSTATING	
COLD WATER SET-POINT	
COLD WATER TEMPERATURE DIFFERENTIAL	
HOT WATER TEMPERATURE THERMOSTAT CONTROLSELECT HOT WATER THERMOSTATING	
HOT WATER SET-POINT	
HOT WATER TEMPERATURE DIFFERENTIAL	
EXIT(EXIT TO PREVIOUS MENU)	

Table 24 - Parameters of menu 3 for hydraulic configuration of the appliance

Description of parameters:

PARAMETER 73:

0: the thermostat control is set on the inlet cold water temperature.

1: the thermostat control is set on the outlet cold water temperature.

PARAMETER 75:

Set the desired cold water set-point (°F)

PARAMETER 76:

Set the desired cold water temperature differential (°F).

Once the water set point has been reached, the unit will re start when the water temperature is higher than: SET POINT + DIFFERENTIAL

PARAMETER 160:

0: the thermostat control is set on the inlet hot water temperature.

1: the thermostat control is set on the outlet hot water temperature.

PARAMETER 161:

Set the desired hot water set-point (°F).

PARAMETER 162:

Set the desired hot water temperature differential (°F).

Once the water set point has been reached, the unit will re start when the water temperature is lower than: SET POINT – DIFFERENTIAL.

Example in cooling mode/priority if the DDC is not installed (see page 45):

Parameter 73: 0

Parameter 75: 45°F

Parameter 76: 6°F

Inlet cold water temperature higher than 45°F: the unit is ON

Inlet cold water lower (or equal) than 45°F: the unit is OFF. The unit will re start when the inlet cold water temperature is higher than 45°F + 6°F = 51°F

Example in heating mode/priority if the DDC is not installed (see page 45):

Parameter 160: 0

Parameter 161: 110°F

Parameter 162: 10°F

Inlet hot water temperature lower than 110°F: the unit is ON

Inlet hot water higher (or equal) than 110°F: the unit is OFF. The unit will re start when the inlet hot water temperature is lower than 110°F - 10°F = 100°F

4.6 UNIT START UP

The unit start up must be performed only by an authorized Robur Service Company.

If the procedure is not performed by an authorized Robur Service Company, the manufacturer will void the warranty.

Efficient operation and lifetime of the appliance depend on the installation and use.

DO NOT PROCEED WITH THE UNIT START UP IF:

- The installation has not been performed in accordance with the technical and safety regulations in force in the local area and following the manufacturer instructions.
- The water, gas and electrical connections have not been made correctly
- The appliance has not been installed indoors or the room is not compliant with local regulations.
- It is not possible to safely access the unit according to the local and national regulations.
- The gas used is different from the one the unit was originally set and the gas nozzle has not been properly changed.
- The ammonia relief valve has not been ducted outside according to the manufacturer guidelines (See chapter 2.9 on page 31).
- The flue gas pipe has not been installed in accordance with this manual..
- The appliance has been damaged during transportation or installation.
- There is a smell of gas.
- There is a smell of ammonia.

START UP PROCEDURE

- Check that the appliance is fitted for the proper type of gas operation by checking the rating plate. Robur GAHP-W and W LB are designed to operate with either natural gas or LPG.
- Check the static gas pressure in the pipeline.
    - Unscrew tap B (See Figure 29).
    - Connect the manometer to B.
    - Open the main gas supply valve. Check for gas leaks.
    - Read the static gas pressure. The correct values are:
      - 7 in_{WC} for natural gas (G20)
      - 11 in_{WC} for L.P. gas.
    - Close the gas valve.
    - Remove the manometer and refasten tap B.

- Check the water pressure in the water loop.
- Power on both the unit and the DDC (if present).
- Set the priority/operating mode (see page 45).
- Check for water leaks.
- Set the manifold gas pressure (see Table 13 on page 25).
    - Unscrew tap C (See Figure 29).
    - Connect the manometer to C.
    - Switch on the unit (see chapter 4.1 on page 47).
    - In case of ignition problem, the flame control box tries three times to ignite. If E212 appears, reset the error (see chapter 4.4 on page 51).
- Once the burner is on, check the manifold gas pressare.
- Adjust the gas pressure if necessary.
    - Remove cap A (See Figure 29).
    - Rotate screw A clockwise to increase or counterclockwise to decrease the pressure. (See Table 13 on page 25).
    - Replace cap A.
- Check the dynamic gas pressure in the pipeline (see Table 13 on page 25).
- Check for gas leaks.
- Set operating parameters (see chapter 4.5 on page 51).
- Check that no warning/error codes are displayed on the electronic board.
- Switch off the unit.
- Remove the manometer and replace tap C.

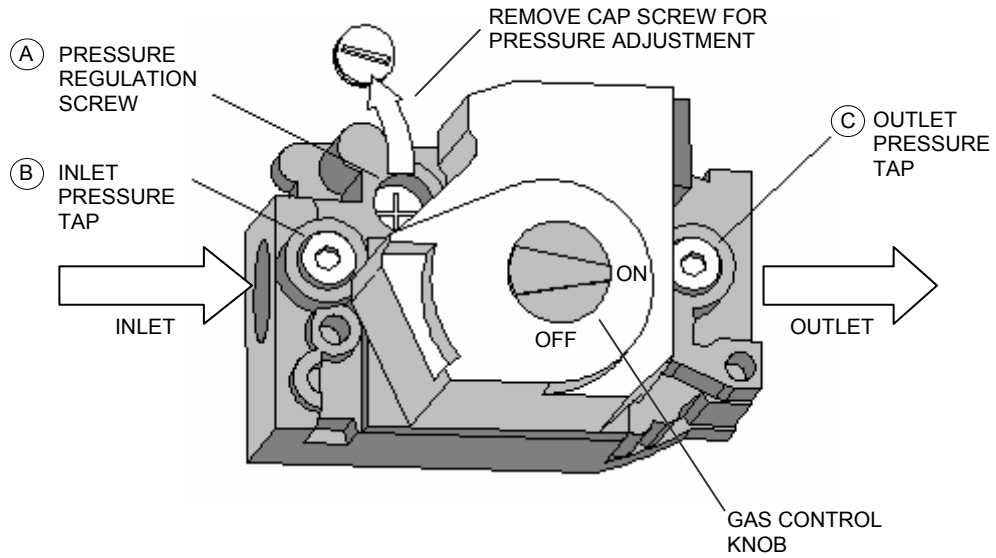


Figure 29 - Gas valve of the appliance

COMPLETE THE START UP PROCEDURE AND THEN SWITCH THE UNITS OFF IF:

- The clearances have not been respected (see Figure 3 on page 16).
- The static pipeline gas pressure does not comply with the Robur specifications indicated in the Robur Installation Manual (see Table 13 on page 25) and data plate.
- The dynamic pipeline gas pressure does not comply with the Robur specifications indicated in the Robur Installation Manual (see Table 13 on page 25) and data plate.

COMPLETE THE START UP PROCEDURE AND ALLOW THE UNITS TO TEMPORARILY RUN WHEN:

- The water strainer is missing or incorrectly installed.
- The expansion vessel is missing.
- The shut-off gas valve near the unit is missing.
- The Can-Bus cable is not compliant with Robur specifications.
- The control system is not supplied by a dedicated electrical transformer.

Fill out the start up report mentioning the following sentence: “The unit has been started temporarily because …..".

It is the user/installer responsibility to fix the non conformities of the installation indicated by the Service Company.

4.7 MAINTENANCE

Correct maintenance prevents problems, guarantees maximum operating efficiency of the appliance and allows running costs to be contained.

The maintenance of the unit must be performed by authorized Robur personnel.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.
Verify proper operation after servicing.

Switch **off the power of the unit and DDC** before doing any maintenance operation.

Maintenance operations can not be performed by the end user.

ORDINARY MAINTENANCE

Perform the following operations at least once every 2 years.

1. Inspect chilled water circuit; check water flow rate, operating pressure and unit flow switch.
2. Check the hydraulic pump oil level. If it is low, check any possible leaking
3. Inspect the belt for proper belt tension, alignment or wear. Replace the beltsand pulleys after 6 years or 12,000 operation hours
4. Check the combustion chamber and burner inside the Robur units for obstruction or leakage. Replace burner gaskets if neccesary.
5. Check the igniter and the flame sensor for function. Replace the igniter and flame sensor gaskets if necessary.
6. Check the gas input to the burner.
7. Check the unit operation and control parameters.
8. Check DDC controller (if present) for Error code history and download it and make corrections to units as required.

If the unit is subject to particularly heavy duty (for example in process plants or in other conditions of continuous operation), these maintenance operations must be more frequent.

4.8 CHANGE OF GAS TYPE

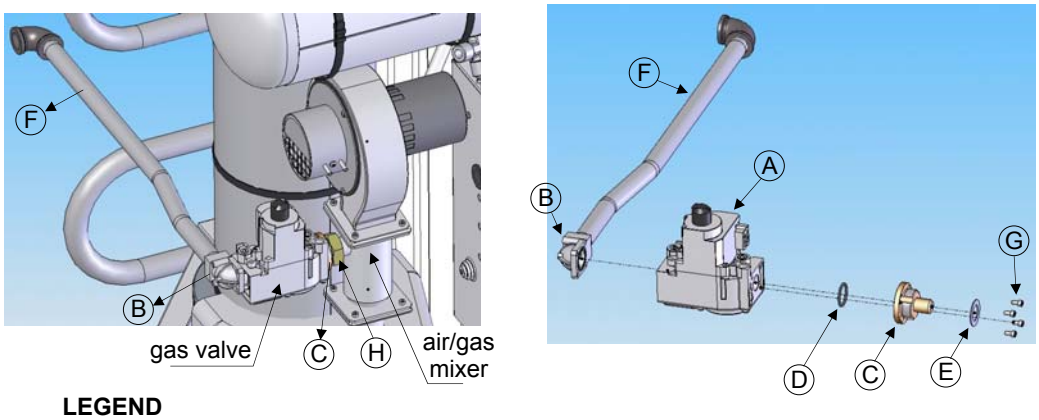
This operation must be perfomed by authorized Robur personell only.

If the appliance has to operate with a gas type different from the one indicated on the rating plate, switch the power off and close the gas supply.

Then, proceed as follow (see Figure 30):

1. Remove the front and left panel of the appliance.
2. Unscrew the hexagonal nut (see details – letter H) that connectings the brass nozzle to the air-/gas mixer; use a number 36 wrench for this purpose.
3. Unscrew the 4 screws (letter G) and remove the nozzle - remove the nozzle by unscrewing the 4 screws (see detail G). Use a 9/64 hex key wrench.
4. Replace the nozzle with the correct one (letter C). Do not forget to place the new o-ring (letter D) between the nozzle and the gas valve. Replace the removed nozzle with one suitable for the gas that is to be used (see detail C), positioning the new o-ring seal (supplied) between valve and nozzle; use a 9/64 hex key wrench to refasten the screws.
5. Reconnect the brass nozzle to the air-gas mixer. Do not forget to place the new gasket (letter E tightening the hexagonal nut, taking care to position the new circular seal (supplied with the kit) correctly;).
6. Open the gas and switch on the power.
7. Set the gas pressure at the value indicated in Table 13 on page 25.

8. Replace the label with the new one indicating the new gas type that has to be used.
9. Check for leaks in all gas pipe connections.
10. Replace the front and left panel.



LEGEND

A GAS VALVE
B GAS VALVE FLANGE
C GAS NOZZLE
D O-RING
E GASKET
F GAS PIPE
G SCREW (n. 4)
H HEXAGONAL NUT

Figure 30 - Gas change

4.9 OPERATING CODES - TROUBLESHOOTING (firmware release 3.027)

The letter “U” before the operating code (three digits) means Warning.

The letter “E” before the operating code (three digits) means Error.

Warning operating codes automatically reset when the reason of the fault disappears.

If the fault persists, warning codes become errors.

Error codes generally need an automatic reset to be perfomed through the S61 board or through the DDC (if present). See chapter 4.4 on page 51.

If the problem persists contact an authorized Robur Service Company.

E 200 – Error 200

Problems in the reset circuit of the ignition control box.

Switch off the power of the unit. If the problem persists contact an authorized Robur Service Company.

W/E 201 – Warning or Error 201

High generator temperature.

Contact an authorized Robur Service Company.

W/E 202 – Warning or Error 202

High flue gas temperature.

If the problem persists contact an authorized Robur Service Company.

W 203 – Warning 203
Antifreeze.
Water temperature is below the operational limit.

E 205 – Warning 205
Ambient temperature higher than operational limit.

W 206 – Warning 206
Ambient temperature lower than operational limit.

W/E 207 – Warning and Error 207
High rectifier temperature.
If the problem persists contact an authorized Robur Service Company.

E 208 – Error 208
Burner “on” with the ignition control box locked.
If the problem persists contact an authorized Robur Service Company.

W/E 210 – Warning and Error 210
Insufficient cold water flow.
If the problem persists contact an authorized Robur Service Company.

W/E 211 – Warning and Error 211
No rotation of the oil pump.
If the problem persists contact an authorized Robur Service Company.

W/E 212 – Warning and Error 212
Ignition control box locked.
If the problem persists contact an authorized Robur Service Company.

E 216 – Error 216
Outlet cold water temperature probe defective.
If the problem persists contact an authorized Robur Service Company.

E 217 – Error 217
Inlet cold water temperature probe defective.
If the problem persists contact an authorized Robur Service Company.

E 220 – Error 220

Rectifier temperature probe defective.

If the problem persists contact an authorized Robur Service Company.

E 228 – Error 228

Gas valve “on” when the ignition control box is locked.

If the problem persists contact an authorized Robur Service Company.

W/E 229 – Warning and Error 229

Gas valve “off” when the ignition control box is “on”.

If the problem persists contact an authorized Robur Service Company.

W 231 – Warning 231

The warning appears when the water temperature is higher than the operational limits (heating).

Reset occurs automatically with 3.6°F hysteresis.

W 232 – Warning 232

The warning appears when the water temperature is lower than the operational limits (cooling).

Reset occurs automatically with 3.6°F hysteresis.

W 246 – Warning 246

Inlet hot water temperature is above the operational limit.

W/E 247 – Warning and Error 247

Inlet hot water temperature is below the operational limit.

W/E 248 – Warning and Error 248

The hot water temperature difference is too high.

If the problem persists contact an authorized Robur Service Company.

E 249 – Error 249

W10 board not recognized or missing.

If the problem persists contact an authorized Robur Service Company.

W 251 – Warning 251

Cold side antifreeze function “on”.

W/E 275 – Warning and Error 275

Insufficient hot water flow.
If the problem persists contact an authorized Robur Service Company.

E 276 – Error 276
Outlet hot water temperature probe defective.
If the problem persists contact an authorized Robur Service Company.

E 277 – Error 277
Inlet hot water temperature probe defective.
If the problem persists contact an authorized Robur Service Company.

W 278 – Warning 278
Outlet hot water temperature is above the operational limit.

W 279 – Warning 279
Hot side antifreeze function “on”.

W 280-281-282 – Warning 280-281-282
Incomplete or wrong set of parameters.
If the problem persists contact an authorized Robur Service Company.

E 284 – Error 284
24 V fuse defective.
If the problem persists contact an authorized Robur Service Company.

E 285-286-287-288-289-291 – Error 285-286-287-288-289-291
S61 board defective.
If the problem persists contact an authorized Robur Service Company.

E 290 – Error 290
Ambient temperature probe defective.
If the problem persists contact an authorized Robur Service Company.

APPENDIX A

IGNITION CONTROL BOX

When power is supplied to the unit (to the “R” terminal on the ignition control box), ignition control will reset, perform a self check routine, flash the diagnostic LED, and enter thermostat scan state.

When the control switch is closed, the electronic control board will energize the ignition control box starting the ignition sequence (24 volts applied to the “W” terminal on the ignition box).

The ignition control box will check the differential air pressure switch for open contacts.

- If the differential air pressure switch contacts are closed and stay closed for 30 seconds, an air flow fault will appear. The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box pre-mixer blower will not start.

If the pressure switch contacts are open, the ignition control box pre-mixer blower will instead start.

- An air flow fault will occur if the air pressure switch contacts remain opened for 30 seconds after the pre-mixer blower start. The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box will keep the pre-mixer blower energized.

If the air pressure switch contacts close after the pre-mixer blower starts (normal operation), a pre-purge delay begins and the ignition sequence continues.

Next, the ignition control box energizes an ignition transformer that generates a high intensity spark at the igniter to ignite the gas/air mixture. Simultaneously, the gas valve is energized, allowing the flow of gas to the burner.

As soon as the ignition period ends, the flame sensor checks for flame presence. If the flame is detected, the gas valve and pre-mixer blower remain energized.

Should the burner fail to light, flame is not detected during the first trial for ignition: the gas valve and ignition transformer are de-energized and the ignition control box begins an inter-purge delay before another ignition attempt. The control will attempt two additional ignition trials (total of 3 ignition trials) before going into lockout. In lockout, the gas valve will de-energize immediately and the pre-mixer blower will turn off. Ignition control box requests a reset operation to restart.

The thermostat (“W” terminal), air pressure switch and burner flame are constantly monitored to assure proper system operation. When the call for heat has ended (24volts removed from “W” terminal on ignition control), the gas valve is de-energized immediately. The ignition control then senses loss of flame and de-energizes the pre-mixer blower.

To reset the ignition box, see related procedure in chapter 4.4 on page 51.

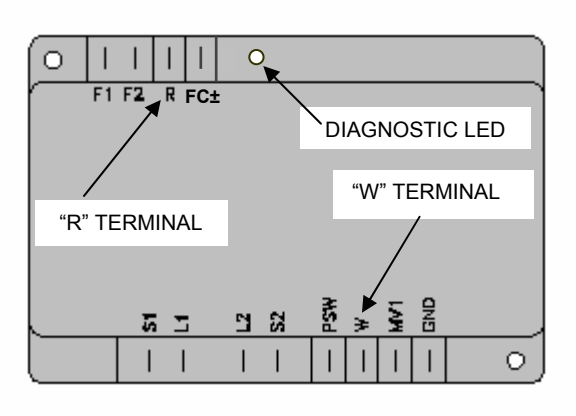


Figure 31 - Ignition control box.

Codice: D-LBR367 rev.G 14 MCMSDC 015 06/11/2014

Robur is dedicated to dynamic progression
in research, devepment and promotion
of safe, environmentally-friendly, energy-efficiency products,
through the commitment and caring
of its employees and partners

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